Professional vehicle power systems

Built for the Road.
Engineered to outlast.

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50
YEARS

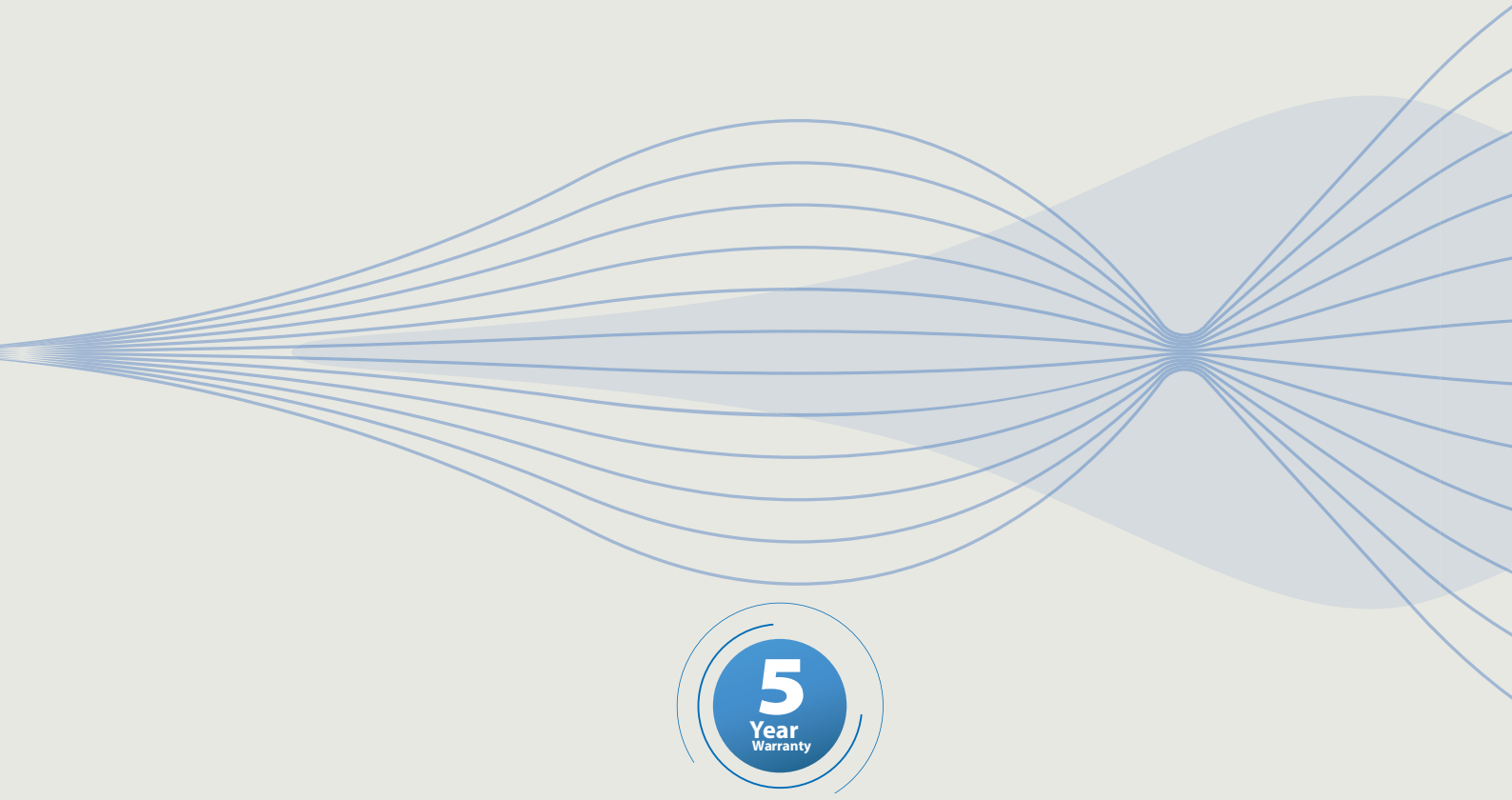
PROFESSIONAL VEHICLE POWER SYSTEMS

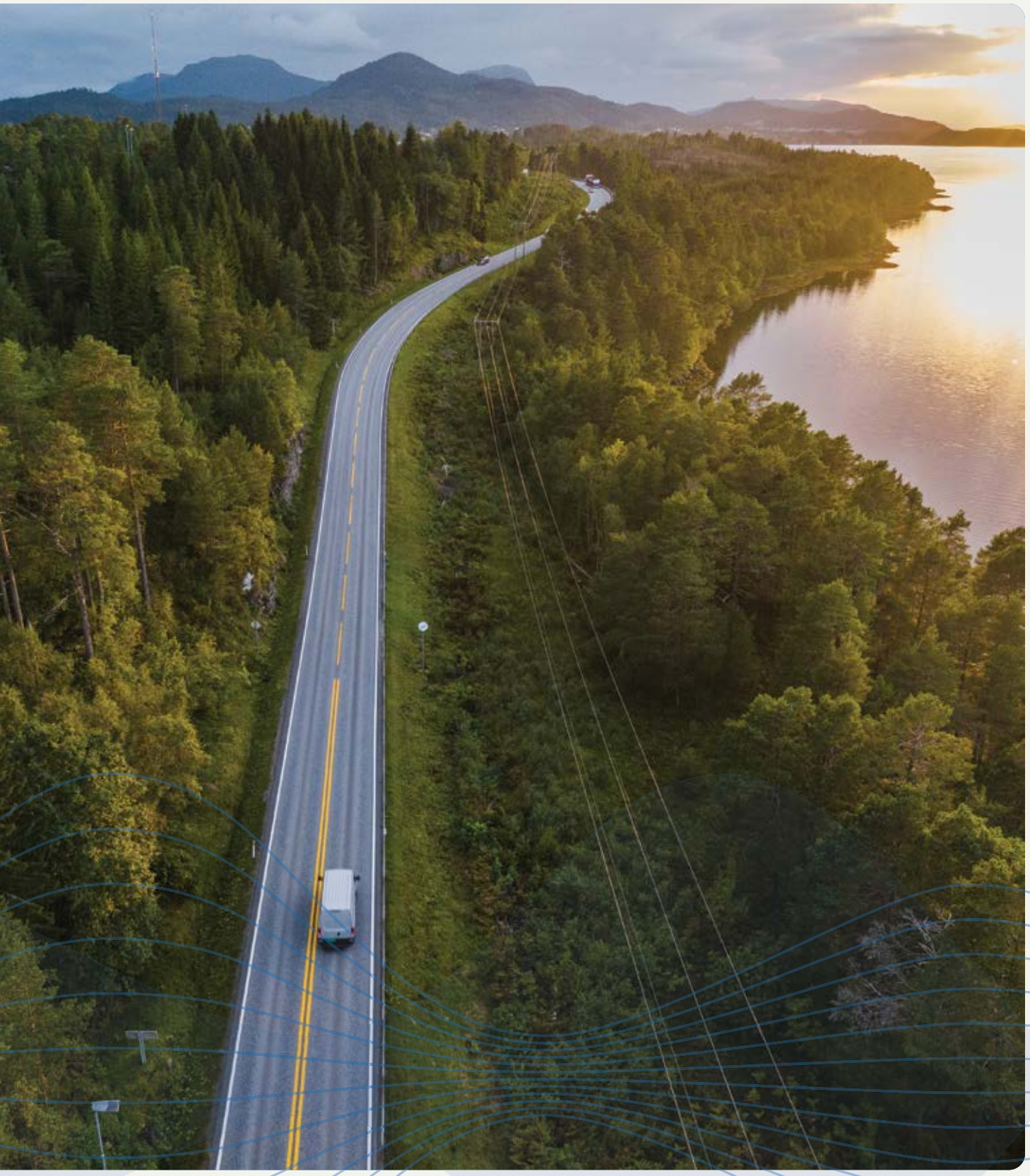
How do you build customisable, cost-effective vehicle power systems that give peace of mind?

The solution is powered by know-how. With over 50 years of experience, we've learned what it takes to build an ecosystem of robust, flexible building blocks with up-to-date features. Through decades of real-world testing and customer input, our products are unmatched in ruggedness, long-term value, and cost of ownership. They perform time and time again, even in the harshest of climates.

Millions of customers value the reassurance our power solutions deliver, always having our worldwide network of authorised dealers by their side. They know our family-run business is built on a foundation of trust they can always depend on.

Energy. Anytime. Anywhere.





Experience the power of Victron Energy monitoring

More than 1 million users wordwide

Works with

VictronConnect app

VRM - Remote Management portal

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Bringing Victron systems together in a user-friendly interface, our energy monitoring technology sets the standard for power management on the road. Thanks to the know-how we put into our connected products, you can keep an eye on your systems and prevent issues before they happen, all from your GX touchscreen, VictronConnect app, or VRM management portal.

See our monitoring solutions in action at victronenergy.com/monitoring

Energy. Anytime. Anywhere.


VERBINDINGS-COMMANDO UNIT
VC90-1
POLITIE
AMBULANCE
BRANDWEER

Index

Life-critical performance. Powered by know-how.

In emergency response, failure is not an option. That's why most ambulance crews worldwide trust Victron Energy to power their vital onboard systems through every life-saving moment. With the Victron Remote Management (VRM) portal, entire rescue fleets stay connected and under control. When every second counts, it's good to know the power of know-how is by your side.

Global market leader for ambulance power systems


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PROFESSIONAL VEHICLE POWER SYSTEMS

Introduction to Professional and specialty vehicle designs

From ambulances to mobile workshops, from refrigerated transports to broadcast vans, professional vehicles need a power supply that works, anywhere, anytime. At Victron Energy, we've built our reputation on providing proven, customisable energy solutions that keep your systems running reliably, no matter where the job takes you.

A solution for any power challenge

Every Victron Energy setup begins with a flexible, modular system designed to adapt to a vehicle's specific requirements. Our product range provides all the essential building blocks to create the exact

solution your application requires, including inverters, chargers, DC-DC converters, and battery management systems. All components work perfectly with both lead-acid and lithium house batteries and connect to any type of vehicle alternator. This ready-to-go versatility gives you reliable performance and straightforward system design, whatever power challenge you're facing.

Control that grows with your needs

Victron systems provide complete control and visibility through user-friendly tools like the VictronConnect app, the Ekrano GX communication centre, and the Victron Remote Management (VRM) platform. For more advanced options, Venus OS and Node-RED enable custom automation, logic, and control workflows to match specific requirements.

Whether the need is for a plug-and-play solution or pushing the boundaries of integration and functionality, Victron Energy provides the ecosystem for both.

Orion XS 1400.

The ready-for-anything DC-DC charger.

Works with any 12V or 24V battery

Engine running detection

Smart Euro 5/6 alternator compatible

Configurable voltage & current

Works with

VictronConnect app

Remote monitoring portal

Setting the standard for professional vehicles, the Orion XS 1400 excels across 12V, 24V, and mixed-voltage systems in the harshest environments. It works with both conventional and intelligent Euro 5/6 alternator setups, featuring engine running detection and voltage drop calibration.

Despite being the smallest DC-DC charger in its class, the Orion's fanless design runs cooler while achieving 98.5% efficiency. Add the adaptive charging algorithm, remote monitoring, and app-based configuration, and you have the ideal solution for service vans, emergency vehicles, and specialty fleets. One that performs, whatever you throw at it.

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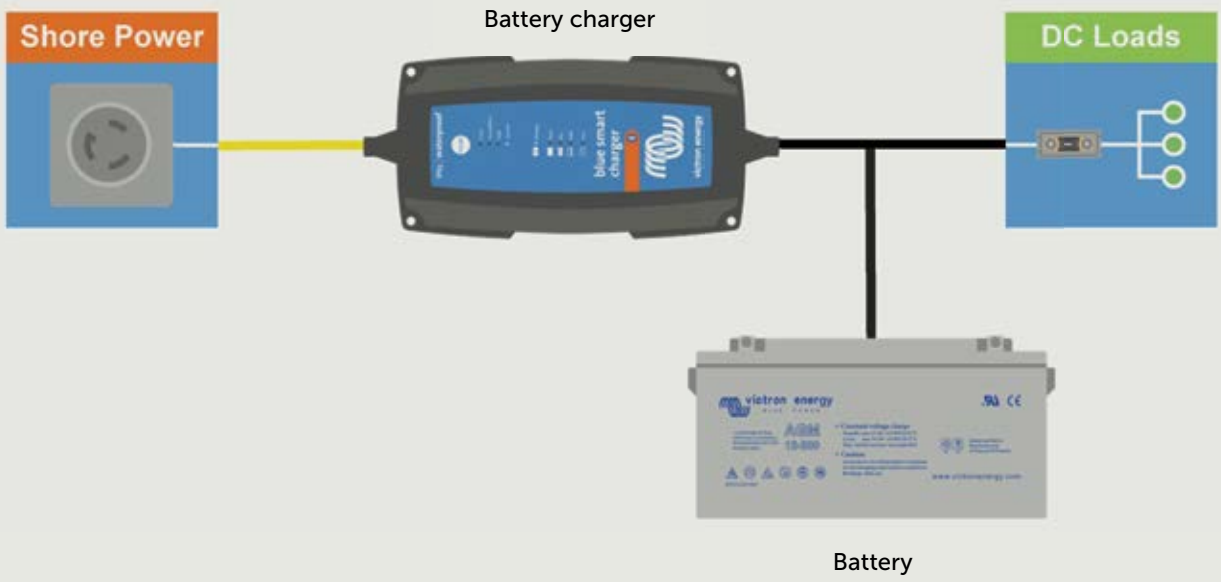
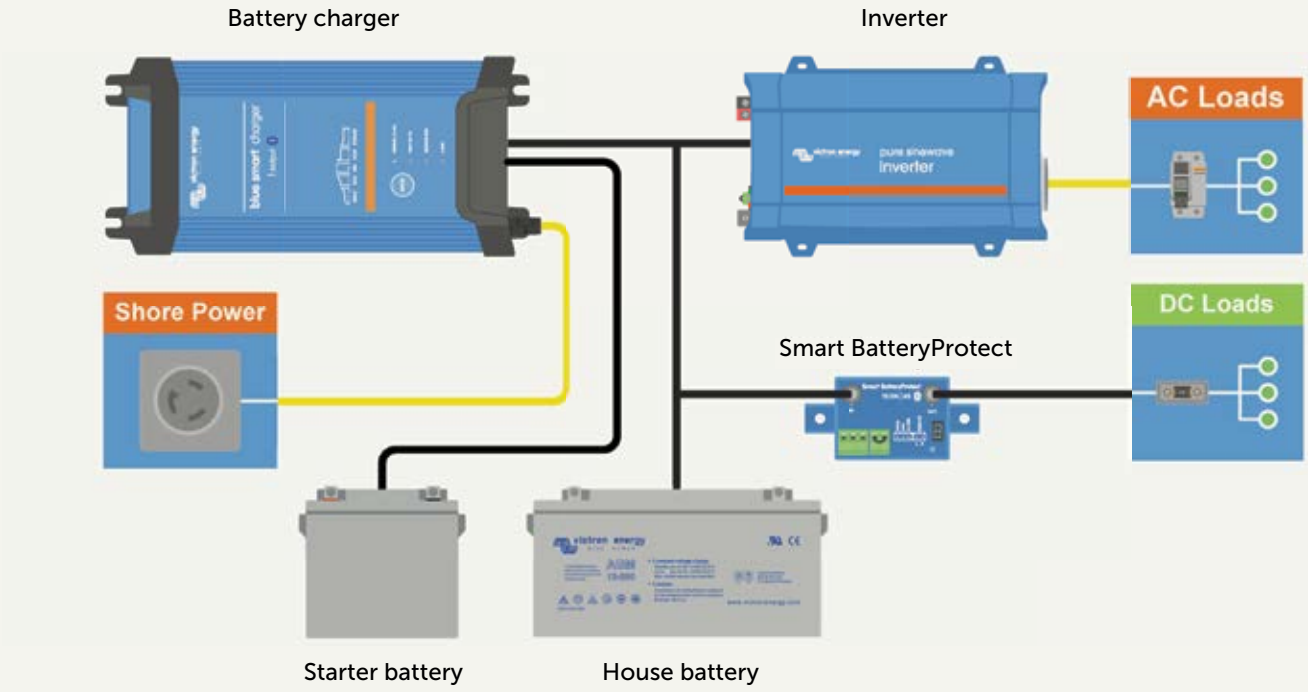
Endless possibilities. One trusted ecosystem.

Every professional vehicle has unique power needs and Victron Energy makes meeting them straightforward.
Using our range of modular components it's easy to scale and configure systems for everything from basic DC setups to advanced multi-unit, solar-integrated, or three-phase installations.
The examples on these pages show how our products work together to create reliable, efficient power solutions for virtually any mobile application.



1. Simple system with only DC loads
Besides charging the battery, the charger also functions as a power supply for DC loads.



2. Charger system with inverter

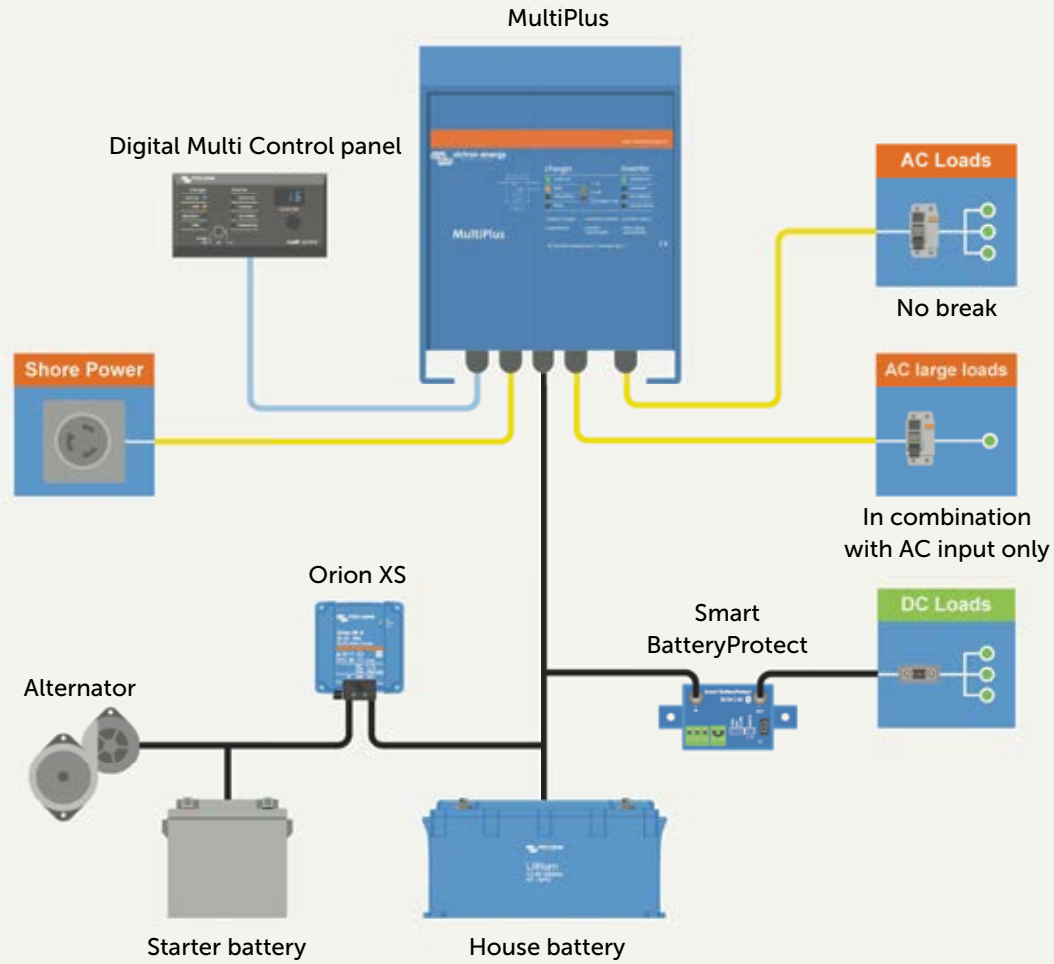
This system includes a charger with three isolated outputs designed to charge independent battery banks. The inverter in this system provides 230V AC loads.

PROFESSIONAL VEHICLE POWER SYSTEMS

MultiPlus vs Quattro

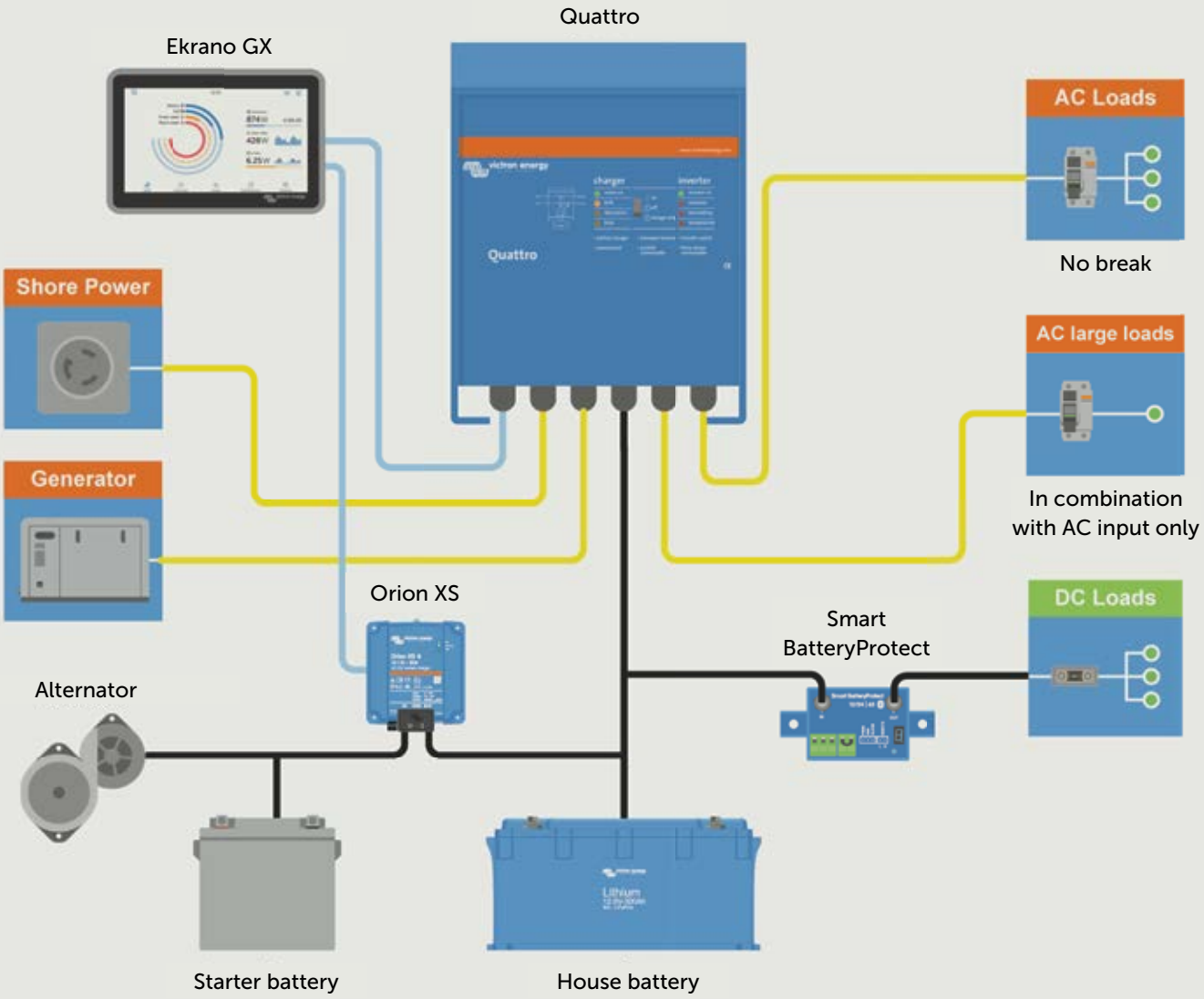
The MultiPlus and Quattro hybrid inverter/charger are at the heart of both AC and DC systems, combining battery charging and power conversion in a single device. When deciding which to choose, the number of AC sources is the determining factor.

The key difference: a Quattro manages two AC sources, automatically switching between them using intelligent rules via its built-in transfer switch. The MultiPlus works with just one AC source.



3. MultiPlus system

The MultiPlus integrates charger and inverter capabilities into one unit, simplifying installation while offering features like PowerControl and PowerAssist.



4. Quattro system

The Quattro offers all the capabilities of the MultiPlus with one key addition:
an integrated transfer switch that automatically selects the available input source.

An extra shot of revenue. Powered by know-how.

When making a ristretto or cappuccino far from the grid, your power supply should be as well-balanced as your coffee blend. From water pump to grinder to espresso machine, Victron Energy keeps your business running smoothly and profitably, anywhere you serve your customers. It's good to know the power of know-how is by your side.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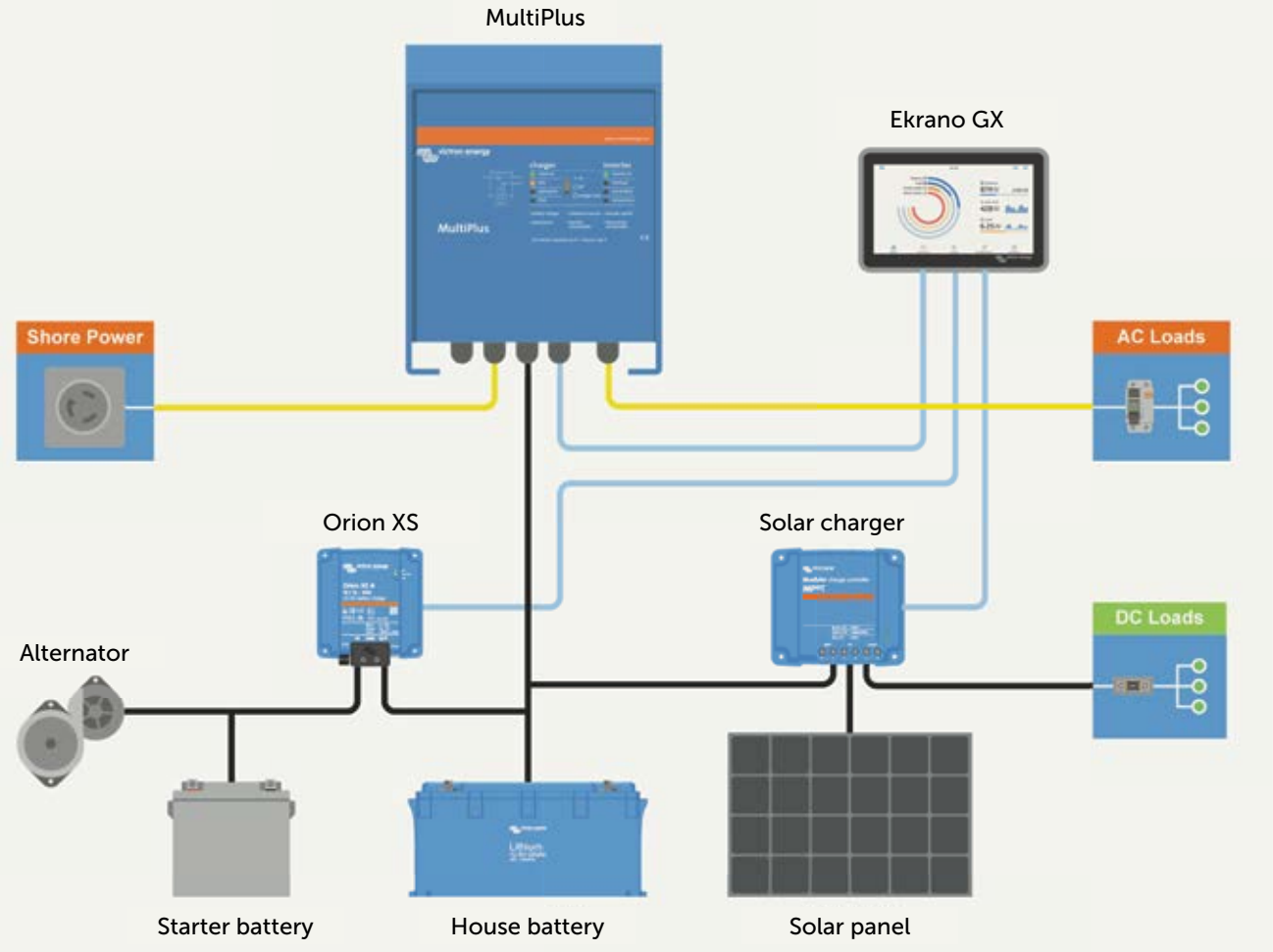
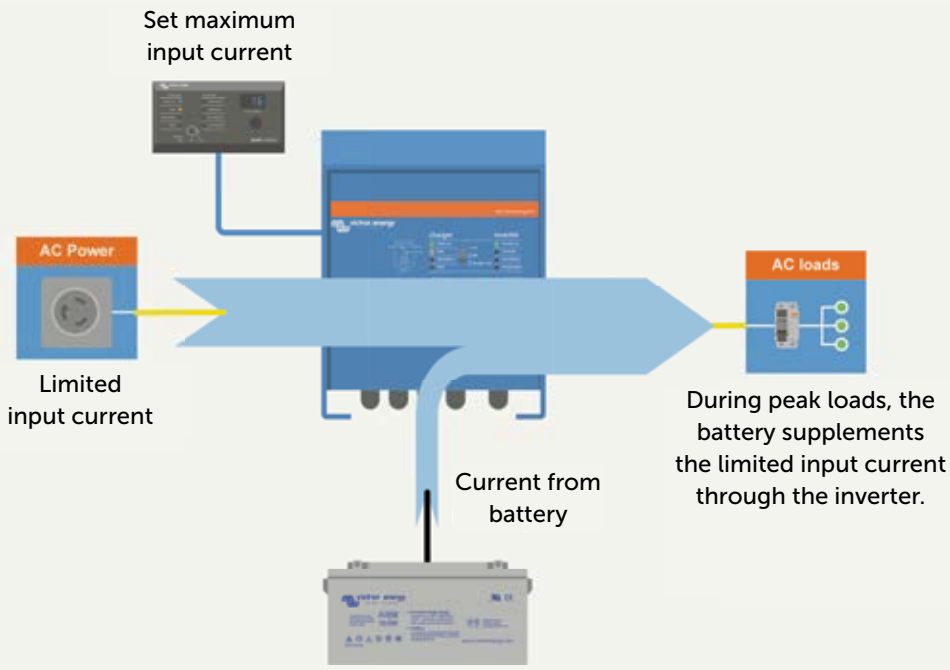
PowerAssist: boosting the capacity of AC or generator power

Get more power when it's needed most, without a bigger generator. The Quattro and MultiPlus support power sources during moments of peak demand, for instance when equipment is starting up. They automatically pull energy from the batteries to bridge the gap and start the recharging process once the power spike passes.

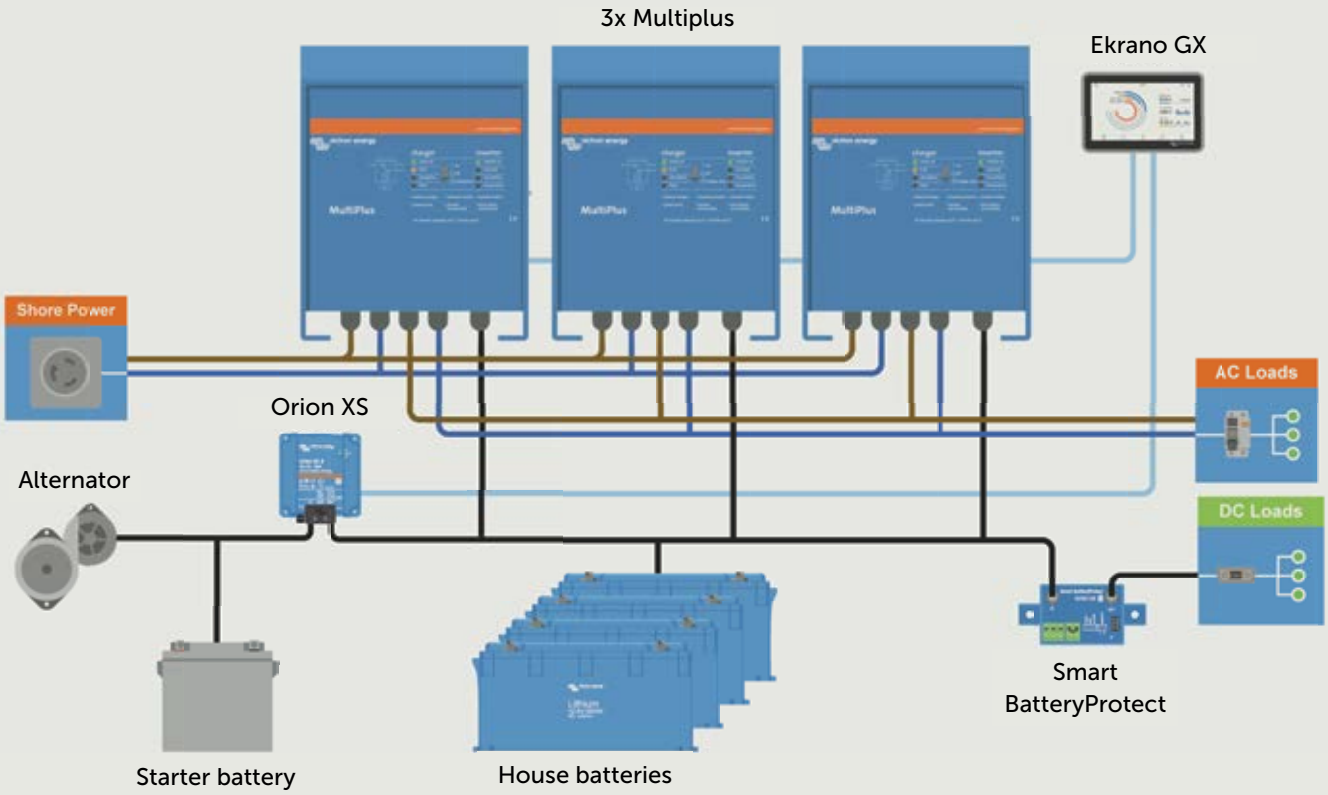
This approach allows for a smaller, more efficient generator that handles typical daily needs, instead of an oversized one just for brief power surges. The result: cost savings, reduced fuel consumption, and reliable power delivery at any time.





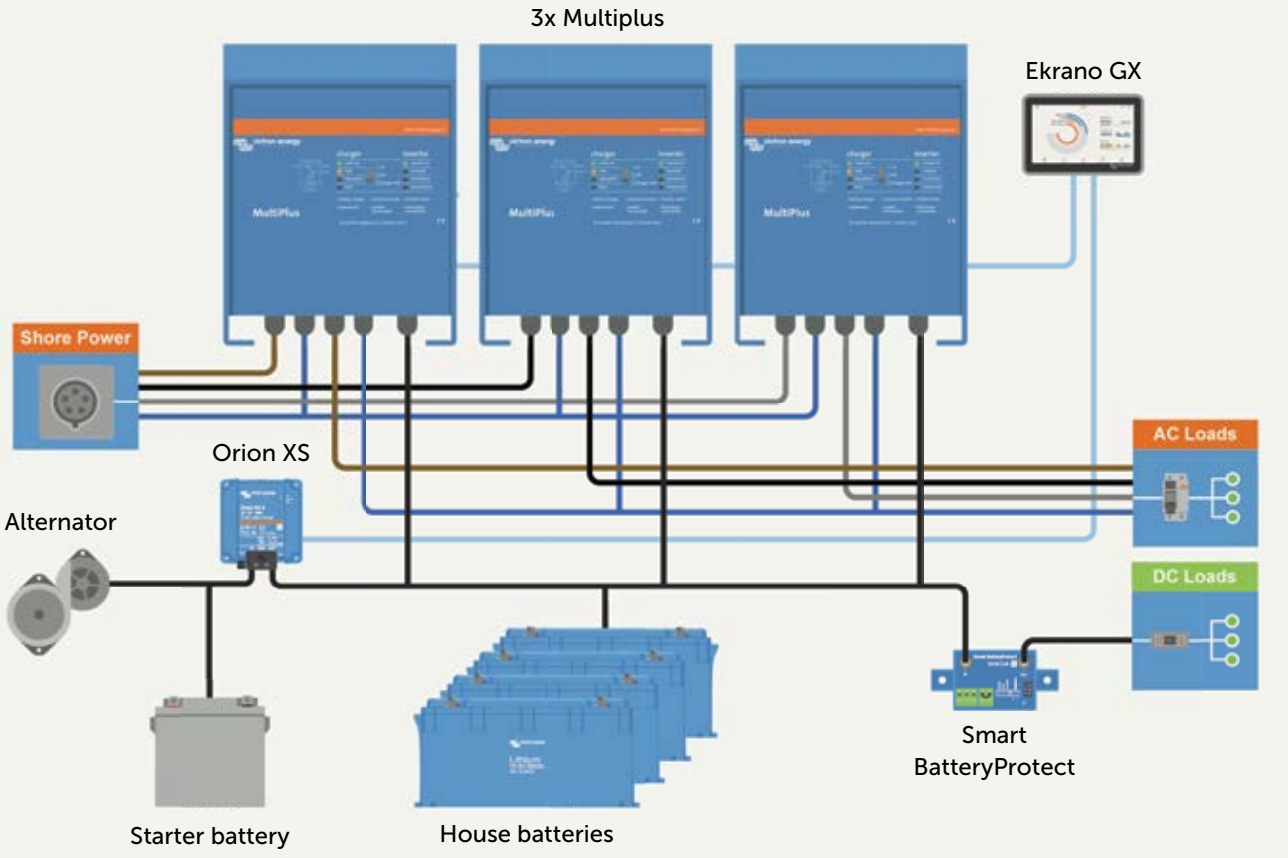
5. MultiPlus system with a solar panel

In this configuration, the batteries charge from three sources: solar power, the alternator, and AC power.



6. Parallel system

Our inverters, MultiPlus and Quattro units can be connected in parallel to meet higher power requirements.



7. Three-phase system

Similar to parallel configurations, MultiPlus and Quattro units can also be connected in split-phase and three-phase arrangements.

System monitoring components

Monitoring is crucial to fine-tune and optimise energy harvest and use based on ever-changing circumstances. Victron provides complete insight into installations, from system performance to tank levels, temperatures and more. For remote monitoring via VRM, add a communication centre such as the Cerbo GX. If local monitoring is sufficient, choose a Smart product.

Learn more at victronenergy.com/monitoring

Cerbo GX
This communication centre allows you to always have perfect control over your system from wherever you are and maximises its performance. Simply connect through our Victron Remote Management (VRM) portal, or access directly, using the separate GX Touch, an MFD or our VictronConnect app with its added Bluetooth capability. Offers the highest level of control thanks to an impressive range of features and integrations.

GX Touch 50 and GX Touch 70
The GX Touch 50 and GX Touch 70 are accessories for our Cerbo GX. The five-inch and seven-inch touchscreen displays give an instant overview of your system and allow you to adjust settings in the blink of an eye. Simply connect to the Cerbo GX with one cable. Their super slim waterproof design, top-mountable setup and simple installation bring a lot of flexibility when creating a crisp and clean dashboard.

Ekrano GX - All-in-one GX device
Combines a full-featured GX device and GX Touch in one. This practical combination of a Cerbo GX and GX Touch gives you easy access to the ports from the back of the device.

GlobalLink 520
The GlobalLink 520 lets you connect Victron VE.Direct equipment, such as battery monitors, MPPT solar chargers, the IP43 Charger or Inverters, with our free remote monitoring website: the VRM Portal. The GlobalLink uses the LTE-M cellular network and the first five years of cellular connectivity are included in the purchase price. The unit is pre-configured and ready to use straight out of the box. No need to change any settings.

GX Tank 140
The GX Tank 140 takes readings from up to four tank level sensors. It is an accessory for our range of GX system monitoring products, of which the Cerbo GX is the most commonly used model.

Tank levels can be read-out locally in the system, see screenshot, as well remotely through our VRM Portal.

GX LTE 4G
The GX LTE 4G is a cellular modem for our GX range of monitoring products. It provides a mobile internet connection for the system and connection to the VRM Portal. It works on 2G, 3G and 4G networks.

Battery Monitors
Key tasks of the Victron Battery Monitor are measuring charge and discharge currents as well as calculating the state-of-charge and time-to-go of a battery. An alarm is sent when certain limits are exceeded (such as an excessive discharge).

SmartSolar Control Display
The SmartSolar Control Display is a detachable LCD display that connects to SmartSolar Charge Controllers. Simply remove the rubber seal that protects the connector on the front of the controller and plug in the display.

Smart BatteryProtect
The Smart BatteryProtect disconnects the battery from non-essential loads before it is completely discharged (which would damage the battery) or before it has insufficient power left to crank the engine.

Smart Battery Sense
The Smart Battery Sense is a wireless battery voltage and temperature sensor for Victron MPPT Solar Chargers. With the Smart Battery Sense in place, batteries will be better charged; improving charging-efficiency and extending battery life.

Extreme endurance. Powered by know-how.

When specialty vehicles face their toughest challenges, OEMs worldwide turn to Victron for energy systems that simply work - delivering reliable performance, smooth integration, and lasting durability. We build for the extremes because professionals can't afford to compromise. That's why it's good to know the power of know-how is by your side.

Photo: Bliss Mobil©

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Helpful system design resources

Victron Energy offers one of the largest product ranges in the market to meet virtually any power challenge. We understand that choosing the right system and products can feel complex. This brochure provides the fundamentals of system design, covering various concepts and solutions for professional vehicle applications.

If you require additional support, turn to our helpful resources or discuss your specific needs with a local Victron specialist.

Check our **Professional vehicles solutions** webpage to explore our deep dive with example calculations.

Product & design information

Our [product pages] on the website provide all necessary product information, such as product data sheets, product manuals, more system examples, enclosure drawings, and certificates

MPPT Calculator

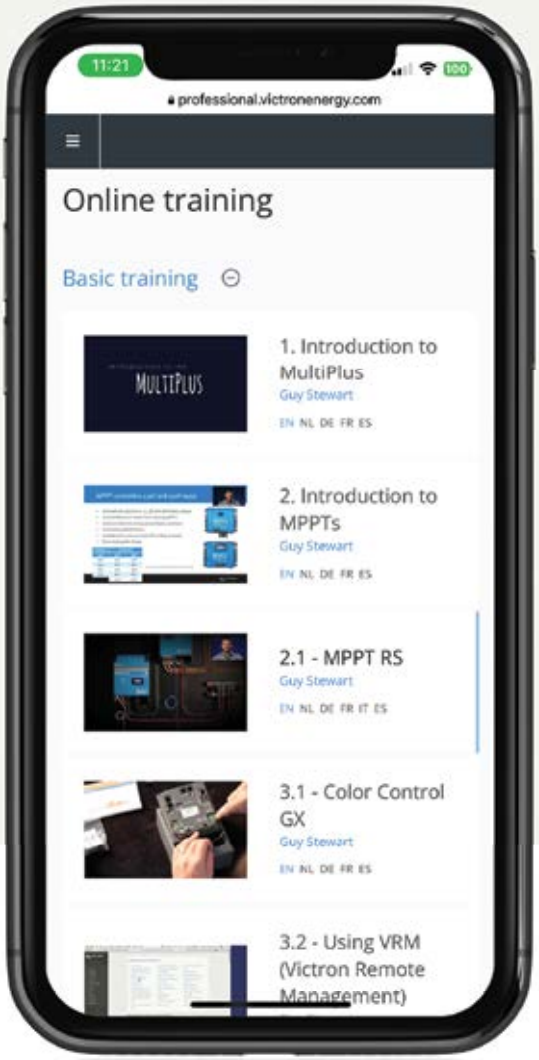
With the MPPT Calculator you can match solar modules to MPPT charge controllers.

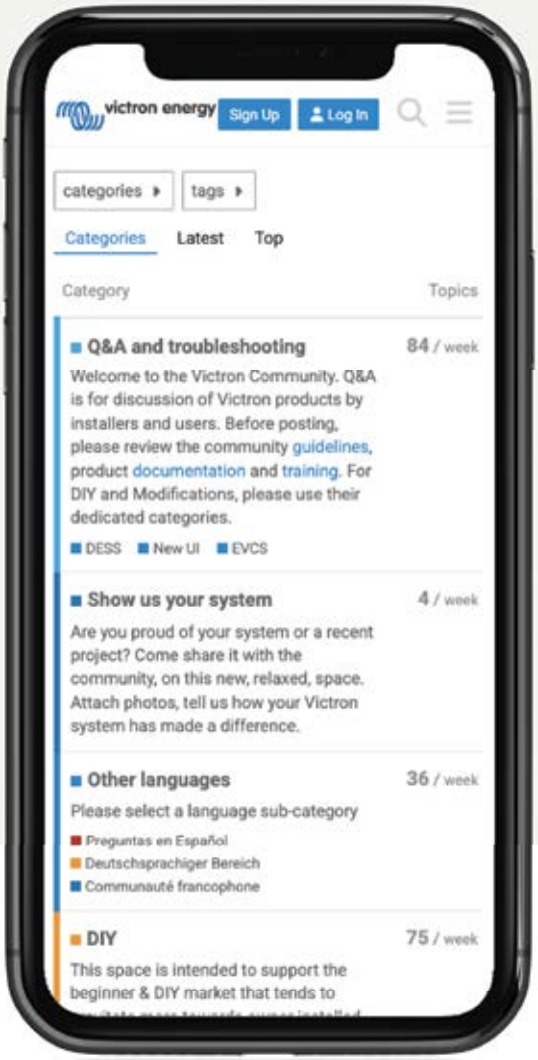
System examples booklet

Download our systems [examples booklet] for vehicles with many different system design examples.

Energy Unlimited & Wiring Unlimited

Understand the principles behind vehicle power systems and get your wiring right with Wiring Unlimited. Find a large variety of technical papers and example system schematics in the [download section].





Victron Professional

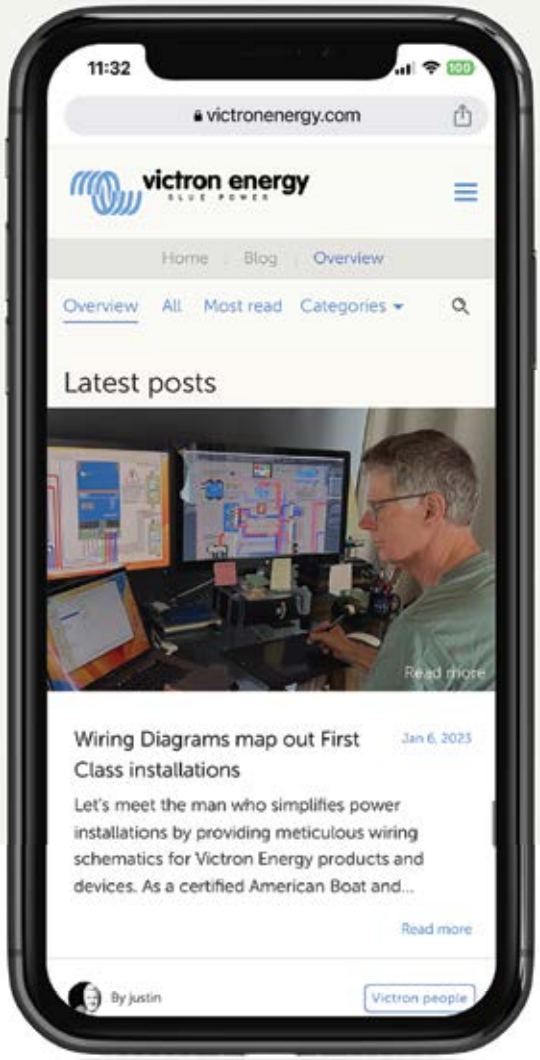
Get updated with the latest developments and access our large range of training courses. Successful completion is rewarded with a certificate.

professional.victronenergy.com

Victron Community

Search our knowledge base for questions and answers or ask our large and active community of experienced Victron users.

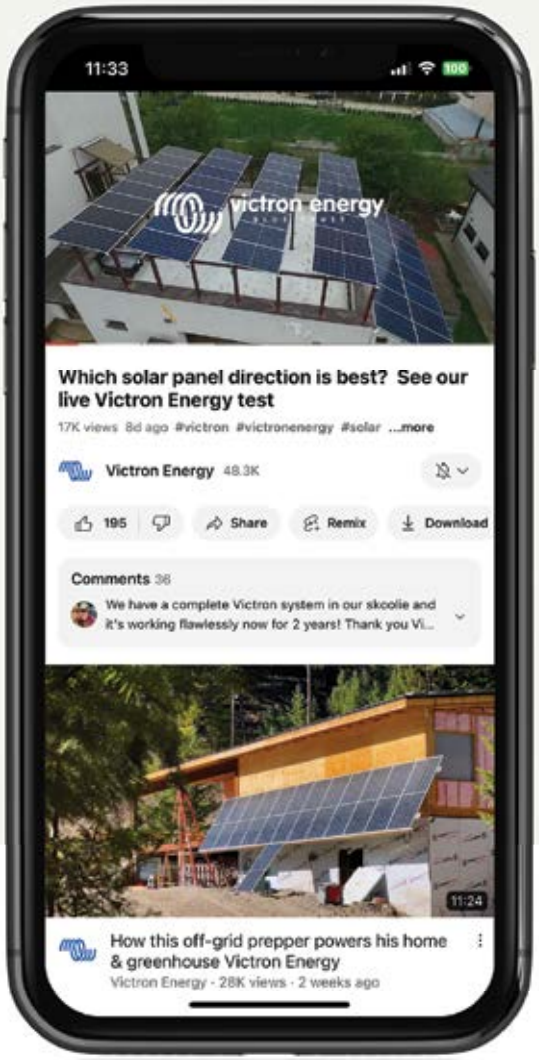
community.victronenergy.com



Victron Energy Blog

Follow interesting cases in great detail, learn about new products and system design resources.

victronenergy.com/blog



YouTube

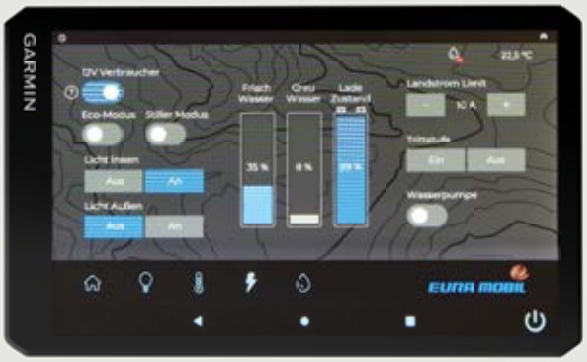
Follow our YouTube channel to see interesting case videos and field tests. Learn from instruction videos, Q&A sessions, and new product introductions.

https://www.youtube.com/victronenergybv

PROFESSIONAL VEHICLE POWER SYSTEMS

Completely integrated on-board power management

Victron Energy offers a ready-to-use platform that connects all vehicle systems. With options like RV-C, SmartSwitch, and Node-RED, it's ideal for RVs, service vans, specialty vehicles and motorhomes. Victron's ecosystem delivers robust, scalable performance for the most demanding professionals. It's supported by worldwide service, experienced technology partners, and field-tested reliability, creating intelligent control systems designed for today's and tomorrow's needs.



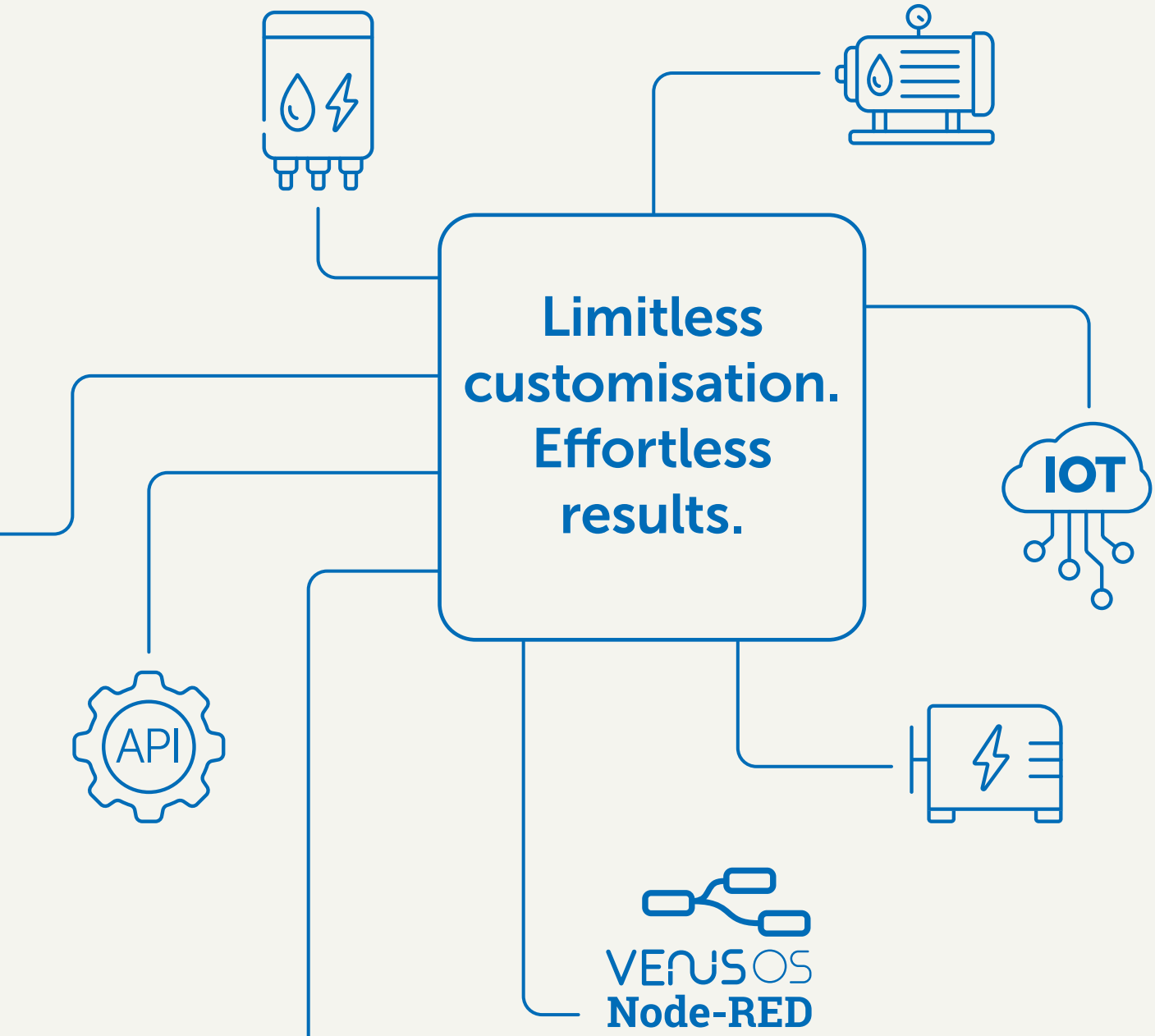
Learn more

RV-C and Garmin Integration

Advanced RV-C connectivity is available through the Cerbo GX MK2, allowing smooth data exchange between Victron and third-party systems in recreational vehicles. Through compatible displays like Garmin's, users can control essential onboard functions such as the electric doorstep, lighting, heating, tank levels, and Victron power devices, all from a single screen. Smart automation can be added, for instance by disabling high-consumption appliances when shore power is disconnected.

GX IO-Extender - digital switching solution

To link GX communication centers to additional devices, controls, and sensors, Victron offers the GX IO-Extender 150. It allows you to control lighting, pumps, fans, and more, using the dedicated switch pane on the GX touchscreen or Node-RED.



Connect it all. Automate it all. With Venus OS and Node-RED.
For advanced applications and specific control needs, Victron supports Node-RED, an open-source visual tool for extensive automation. Create sequences, set conditional triggers, and connect with third-party systems or APIs using a practical drag-and-drop interface. Our network of authorised integration specialists is ready to support you. Get expert help or join the program.

Lifted sustainability. Powered by know-how.

Victron Energy offers one of the widest product ranges in the industry, making it possible to power virtually any specialty vehicle, from construction equipment to mobile clinics and beyond. When it's time to electrify your fleet and reduce emissions instantly, it’s good to know the power of know-how is by your side.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www.BKV.nl
BKV

Note - for our latest datasheets please refer to our website: www.victronenergy.com

Technical information

The smartest way to use solar. Powered by know-how.

If you want to store solar energy for self-consumption and charge your EV with the excess, it's good to know the power of know-how is by your side.

Download our ESS brochure on victronenergy.com


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INVERTERS 250VA - 1200VA VE.DIRECT

Inverter 12/375 VE.Direct

Inverter 12/375 VE.Direct

VE.Direct communication port

The VE.Direct port can be connected to:

- A computer (VE.Direct to USB interface cable needed)
- Apple and Android smartphones, tablets, MacBook's and other devices (VE.Direct Bluetooth Smart dongle needed)

Fully configurable:

- Low battery voltage alarm trip and reset levels
- Low battery voltage cut-off and restart levels
- Dynamic cut-off: load dependent cut-off level
- Output voltage 210 - 245V
- Frequency 50 Hz or 60 Hz
- ECO mode on/off and ECO mode sense level

Monitoring:

- In- and output voltage, % load and alarms

Proven reliability

The full bridge plus toroidal transformer topology has proven its reliability over many years.
The inverters are short circuit proof and protected against overheating, whether due to overload or high ambient temperature.

High start-up power

Needed to start loads such as power converters for LED lamps, halogen lamps or electric tools.

ECO mode

When in ECO mode, the inverter will switch to standby when the load decreases below a preset value (min load: 15W). Once in standby the inverter will switch on for a short period (adjustable, default: every 2,5 seconds). If the load exceeds a preset level, the inverter will remain on.

Remote on/off

A remote on/off switch can be connected to a two-pole connector, or between battery plus and the left-hand contact of the two-pole connector.

LED diagnosis

Please see manual for a description.

To transfer the load to another AC source: the automatic transfer switch

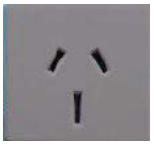
For our low power inverters, we recommend our Filax Automatic Transfer Switch. The Filax features a very short switchover time (less than 20 milliseconds) so that computers and other electronic equipment will continue to operate without disruption.

Available with different output sockets

Schuko

UK

AU/NZS



IEC-320
(male plug included)

Nema 5-15R

GFCI

DC connection with screw terminals

No special tools needed for installation

Inverter 12 Volt / 24 Volt / 48 Volt	12/250 / 24/250 / 48/250	12/375 / 24/375 / 48/375	12/500 / 24/500 / 48/500	12/800 / 24/800 / 48/800	12/1200 / 24/1200 / 48/1200
Cont. power at 25°C (1)	250VA	375VA	500VA	800VA	1200VA
Cont. power at 25°C / 40°C	200 / 175W	300 / 260W	400 / 350W	650 / 560W	1000 / 850W
Peak power	400W	700W	900W	1500W	2200W
Output AC voltage / frequency (adjustable)	230VAC or 120VAC +/- 3% 50Hz or 60Hz +/- 0,1%				
Input voltage range	9,2 - 17 / 18,4 - 34,0 / 36,8 - 62,0V				
DC low shut down (adjustable)	9,3 / 18,6 / 37,2V				
Dynamic (load dependent) DC low shut down (fully configurable)	Dynamic cut-off, see https://www.victronenergy.com/live/ve.direct:phoenix-inverters-dynamic-cutoff				
DC low restart and alarm (adjustable)	10,9 / 21,8 / 43,6V				
Battery charged detect (adjustable)	14,0 / 28,0 / 56,0V				
Max. efficiency	87 / 88 / 88%	89 / 89 / 90%	90 / 90 / 91%	90 / 90 / 91%	91 / 91 / 92%
Zero-load power	4,2 / 5,2 / 7,9W	5,6 / 6,1 / 8,5W	6 / 6,5 / 9W	6,5 / 7 / 9,5W	7 / 8 / 10W
Default zero-load power in ECO mode (default retry interval: 2,5 s, adjustable)	0,8 / 1,3 / 2,5W	0,9 / 1,4 / 2,6W	1 / 1,5 / 3,0W	1 / 1,5 / 3,0W	1 / 1,5 / 3,0W
ECO mode stop and start power setting	Adjustable				
Protection (2)	a - f				
Operating temperature range	-40 to +65°C (fan assisted cooling) Derate 1,25% per °C above 40°C				
Humidity (non-condensing)	max 95%				
ENCLOSURE					
Material & Colour	Steel chassis and plastic cover (blue Ral 5012)				
Battery-connection	Screw terminals				
Maximum cable cross-section	10mm² / AWG8	10mm² / AWG8	10mm² / AWG8	25 / 10 / 10mm² / AWG4 / 8 / 8	35 / 25 / 25mm² / AWG2 / 4 / 4
Standard AC outlets	230V: Schuko (CEE 7/4), IEC-320 (male plug included) UK (BS 1363), AU/NZ (AS/NZS 3112) 120V: Nema 5-15R, GFCI				
Protection category	IP 21				
Weight	2,4kg / 5,3lbs	3,0kg / 6,6lbs	3,9kg / 8.5lbs	5,5kg / 12lbs	7,4kg / 16,3lbs
Dimensions (h x w x d, mm) (h x w x d, inch)	86 x 165 x 260 3.4 x 6.5 x 10.2 120V Nema GFCI 85 x 182 x 255 3,3 x 7.2 x 10.2	86 x 165 x 260 3.4 x 6.5 x 10.2 120V Nema GFCI 85 x 182 x 260 3.3 x 7.2 x 10.2	86 x 172 x 275 3,4 x 6,8 x 10,8 120V Nema GFCI 85 x 182 x 274 3.3 x 7.2 x 10.8	105 x 216 x 305 4.1 x 8.5 x 12.1 (12V model: 105 x 230 x 325 4.1 x 9 x 12.8)	117 x 232 x 327 4.6 x 9.1 x 12.9 (12V model: 117 x 232 x 362 4.6 x 9.1 x 14.2)
ACCESSORIES					
Remote on-off	Yes				
Automatic transfer switch	Filax				
STANDARDS					
Safety	EN-IEC 60335-1 / EN-IEC 62109-1 / UL 458 (3)				
EMC	EN 55014-1 / EN 55014-2 / IEC 61000-6-1 / IEC 61000-6-2 / IEC 61000-6-3				
Automotive Directive	ECE R10-4				

1) Nonlinear load, crest factor 3:1
2) Protection key:
   a) output short circuit
   b) overload
   c) battery voltage too high
   d) battery voltage too low
   e) temperature too high
   f) DC ripple too high

3) UL 458 only for inverters with GFCI output socket

Battery Alarm
An excessively high or low battery voltage is indicated by an audible and visual alarm, and a relay for remote signalling.

BMV Battery Monitor
The BMV Battery Monitor features an advanced microprocessor control system combined with high resolution measuring systems for battery voltage and charge/discharge current. Besides this, the software includes complex calculation algorithms to exactly determine the state of charge of the battery. The BMV selectively displays battery voltage, current, consumed Ah or time to go. The monitor also stores a host of data regarding performance and use of the battery.

VE.Direct Bluetooth Smart dongle (must be ordered separately)

INVERTERS SMART 1600VA - 5000VA

Inverter Smart 12/3000

Bluetooth built-in: fully configurable with a tablet or smartphone

- Low battery voltage alarm
- Low battery voltage cut-off and restart levels
- Dynamic cut-off: load dependent cut-off level
- Output voltage: 210 – 245 V
- Frequency: 50 Hz or 60 Hz
- ECO mode on/off and ECO mode sense level
- Alarm relay

Monitoring:

- In- and output voltage, load and alarms

VE.Direct communication port

The VE.Direct port can be connected to a computer (VE.Direct to USB interface cable needed) to configure and monitor the same parameters.

Proven reliability

The full bridge plus toroidal transformer topology has proven its reliability over many years.
The inverters are short circuit proof and protected against overheating, whether due to overload or high ambient temperature.

High start-up power

Needed to start loads such as power converters for LED lamps, halogen lamps or electric tools.

ECO mode

When in ECO mode, the inverter will switch to standby when the load decreases below a preset value. Once in standby the inverter will switch on for a short period every 2,5 seconds (adjustable).
If the load exceeds the preset level, the inverter will remain on.

Remote on/off

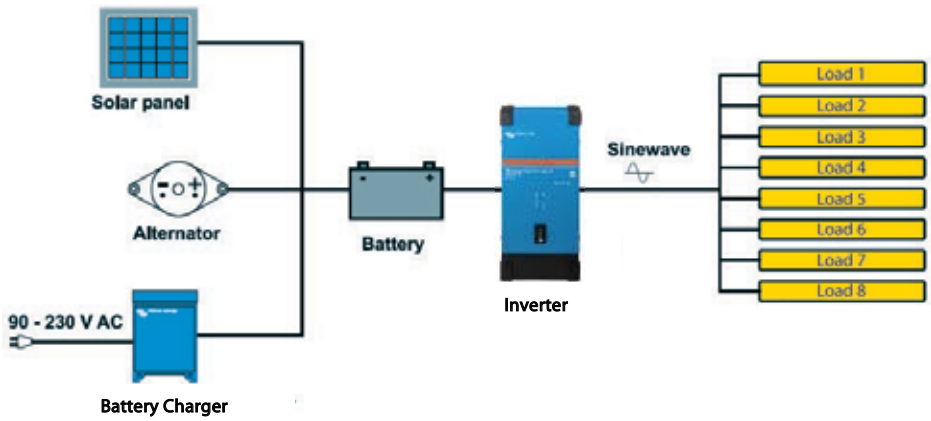
A remote on/off switch or relay contact can be connected to a two pole connector.
Alternatively, the H terminal (left) of the two pole connector can be switched to battery plus, or the L terminal (right) of the two pole connector can be switched to battery minus (or the chassis of a vehicle, for example).

LED diagnosis

Please see manual for a description.

To transfer the load to another AC source: the automatic transfer switch

For our low power inverters we recommend our Filax Automatic Transfer Switch. The Filax features a very short switchover time (less than 20 milliseconds) so that computers and other electronic equipment will continue to operate without disruption. Alternatively use a MultiPlus with built-in transfer switch.



Inverter Smart	12/1600 24/1600 48/1600	12/2000 24/2000 48/2000	12/3000 24/3000 48/3000	24/5000 48/5000
Parallel and 3-phase operation	No			
INVERTER				
Input voltage range	9.3 – 17 V 18.6 – 34 V 37.2 – 68 V			
Output	Output voltage: 230 VAC ±2 % 50 Hz or 60 Hz ± 0.1 % (1)			
Cont. output power at 25 °C (1)	1600 VA	2000 VA	3000 VA	5000 VA
Cont. output power at 25 °C	1300 W	1600 W	2400 W	4000 W
Cont. output power at 40 °C	1200 W	1450 W	2200 W	3700 W
Cont. output power at 65 °C	800 W	1000 W	1700 W	2800 W
Peak power	3000 W	4000 W	6000 W	10000 W
Dynamic (load dependent) DC low shut down (fully configurable)	Dynamic cut-off, see https://www.victronenergy.com/live/ve.direct:phoenix-inverters-dynamic-cutoff			
Max. efficiency 12/ 24 /48 V	92 / 94 / 94 %	92 / 94 / 94 %	93 / 94 / 95 %	95 / 96 %
Zero load power 12 / 24 / 48 V	8 / 9 / 11 W	8 / 9 / 11 W	12 / 13 / 15 W	18 / 20 W
Zero load power in ECO mode	0.6 / 1.3 / 2.1 W	0.6 / 1.3 / 2.1 W	1.5 / 1.9 / 2.8 W	2.2 / 3.2 W
GENERAL				
Programmable relay (2)	Yes			
Stop & start power ECO-mode	adjustable			
Protection (3)	a - g			
Bluetooth wireless communication	For remote monitoring and system integration			
VE.Direct communication port	For remote monitoring and system integration			
Remote on-off	Yes			
Common Characteristics	Operating temperature range: -40 to +65 °C (fan assisted cooling) Humidity (non-condensing): max 95 %			
ENCLOSURE				
Common Characteristics	Material & Colour: steel (blue RAL 5012; and black RAL 9017) Protection category: IP21			
Battery-connection	M8 bolts	M8 bolts	12 V/24 V: 2+2 M8 bolts 48 V: M8 bolts	24 V: 2+2 M8 bolts 48 V: M8 bolts
230 VAC-connection	Screw terminals			
Weight	12 kg	13 kg	19 kg	29 kg / 28 kg
Dimensions (hxwxd)	485 x 219 x 125 mm	485 x 219 x 125 mm	533 x 285 x 150 mm (12 V) 485 x 285 x 150 mm (24 V/48 V)	595 x 295 x 160 mm (24 V) 555 x 295 x 160 mm (48 V)
STANDARDS				
Safety	EN 60335-1			
Emission Immunity	EN 55014-1 / EN 55014-2/ EN-IEC 61000-6-1 / EN-IEC 61000-6-2 / EN-IEC 61000-6-3			
Automotive Directive	ECE R10-5			

1) Non-linear load, crest factor 3:1
2) Programmable relay that can a.o. be set for general alarm, DC under voltage or genset start/stop function.
AC rating: 230 V / 4 A
DC rating: 4 A / 35 VDC, 1 A / 60 VDC

3) Protection key:
a) output short circuit
b) overload
c) battery voltage too high
d) battery voltage too low
e) temperature too high
f) 230 VAC on inverter output
g) input voltage ripple too high

Inverter Control
This panel is intended for remote on/off control of all Inverters Smart units.

Color Control GX and other GX devices
Provides monitoring and control.
Locally, and remotely on the VRM Portal.

VE.Direct to USB interface
Connects to a USB port.

Bluetooth wireless communication
Connects to a smart phone (both iOS and Android).

BMV-712 Smart Battery Monitor
The BMV Battery Monitor features an advanced microprocessor control system combined with high resolution measuring systems for battery voltage and charge/discharge current. Besides this, the software includes complex calculation algorithms, like Peukert's formula, to exactly determine the state of charge of the battery. The BMV selectively displays battery voltage, current, consumed Ah or time to go. The monitor also stores a host of data regarding performance and use of the battery.

INVERTERS 1200VA - 5000VA 230V

Inverter 24/5000

SinusMax - Superior engineering

Developed for professional duty, this range of inverters is suitable for the widest range of applications. The design criteria have been to produce a true sine wave inverter with optimized efficiency but without compromise in performance. Employing hybrid HF technology, the result is a top quality product with compact dimensions, light in weight and capable of supplying power, problem-free, to any load.

Extra start-up power

A unique feature of the SinusMax technology is very high start-up power. Conventional high frequency technology does not offer such extreme performance. The Inverters, however, are well suited to power up difficult loads such as refrigeration compressors, electric motors and similar appliances.

Virtually unlimited power thanks to parallel and 3-phase operation capability

Up to 6 units inverters can operate in parallel to achieve higher power output. Six 24/5000 units, for example, will provide 24 kW / 30 kVA output power. Operation in 3-phase configuration is also possible.

To transfer the load to another AC source: the automatic transfer switch

If an automatic transfer switch is required we recommend using the MultiPlus inverter/charger instead. The switch is included in these products and the charger function of the MultiPlus can be disabled. Computers and other electronic equipment will continue to operate without disruption because the MultiPlus features a very short switchover time (less than 20 milliseconds).

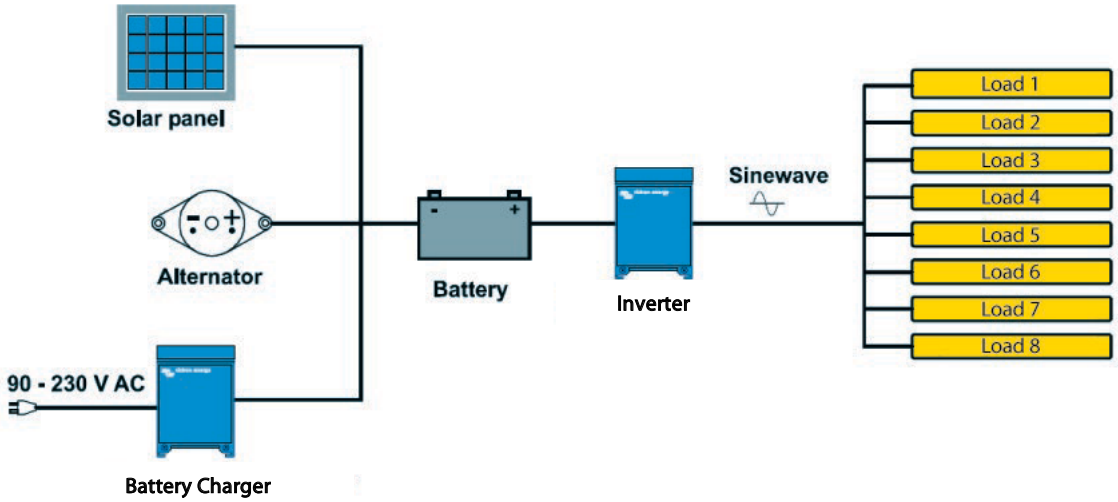
Communications interface

These larger inverter models come with a VE.Bus port. All you need to connect to your PC is our MK3-USB VE.Bus to USB interface (see under accessories). Together with our VictronConnect or VEConfigure software, which can be downloaded free of charge from our website, parameters of the inverters can be customized. This includes output voltage and frequency, over and under voltage settings and programming the relay. This relay can for example be used to signal several alarm conditions, or to start a generator. The inverters can also be connected to a GX device (eg Cerbo GX) for monitoring and control.

New applications of high power inverters

The possibilities of paralleled high power inverters are truly amazing. For ideas, examples and battery capacity calculations please refer to our book 'Energy Unlimited' (available free of charge from Victron Energy and downloadable from www.victronenergy.com).

Inverter Compact 24/1600



Inverter	C12/1200 C24/1200	C12/1600 C24/1600	C12/2000 C24/2000	12/3000 24/3000 48/3000	24/5000 48/5000
Parallel and 3-phase operation	Yes				
INVERTER					
Input voltage range (VDC)	9,5 – 17 V 19 – 33 V 38 – 66 V				
Output	Output voltage: 230 VAC ± 2 % Frequency: 50 Hz ± 0,1 % (1)				
Cont. output power at 25 °C (VA) (2)	1200	1600	2000	3000	5000
Cont. output power at 25 °C (W)	1000	1300	1600	2400	4000
Cont. output power at 40 °C (W)	900	1200	1450	2200	3700
Cont. output power at 65 °C (W)	600	800	1000	1700	3000
Peak power (W)	2400	3000	4000	6000	10000
Max. efficiency 12/ 24 / 48V (%)	92 / 94	92 / 94	92 / 92	93 / 94 / 95	94 / 95
Zero load power 12 / 24 / 48V (W)	8 / 10	8 / 10	9 / 11	20 / 20 / 25	30 / 35
Zero load power in AES mode (W)	5 / 8	5 / 8	7 / 9	15 / 15 / 20	25 / 30
Zero load power in Search mode (W)	2 / 3	2 / 3	3 / 4	8 / 10 / 12	10 / 15
GENERAL					
Programmable relay (3)	Yes				
Protection (4)	a - g				
VE.Bus communication port	For parallel and three phase operation, remote monitoring and system integration				
Remote on-off	Yes				
Common Characteristics	Operating temperature range: -40 to +65 °C (fan assisted cooling) Humidity (non-condensing): max 95 %				
ENCLOSURE					
Common Characteristics	Material & Colour: aluminium (blue RAL 5012) Protection category: IP21				
Battery-connection	battery cables of 1.5 meter included		M8 bolts	2+2 M8 bolts	
230 V AC-connection	G-ST18i plug		Spring-clamp	Screw terminals	
Weight (kg)	10		12	18	30
Dimensions (hxwhd in mm)	375 x 214 x 110		520 x 255 x 125	362 x 258 x 218	444 x 328 x 240
STANDARDS					
Safety	EN 60335-1				
Emission Immunity	EN 55014-1 / EN 55014-2				

1) Can be adjusted to 60 Hz and to 240 V
2) Non-linear load, crest factor 3:1
3) Programmable relay that can a.o. be set for general alarm, DC under voltage or genset start/stop function.
AC rating: 230 V / 4 A
DC rating: 4 A up to 35 VDC, 1 A up to 60 VDC

4) Protection key:
a) output short circuit
b) overload
c) battery voltage too high
d) battery voltage too low
e) temperature too high
f) 230 VAC on inverter output
g) input voltage ripple too high

Inverter Control

This panel can also be used on a MultiPlus Inverter/Charger when an automatic transfer switch but no charger function is desired.
The brightness of the LEDs is automatically reduced during night time.

Computer controlled operation and monitoring

Several interfaces are available:

Color Control GX

Provides monitor and control. Locally, and also remotely on the VRM Portal.

MK3-USB VE.Bus to USB interface

Connects to a USB port (see 'A guide to VEConfigure')

VE.Bus to NMEA 2000 interface

Connects the device to a NMEA 2000 marine electronics network. See the NMEA 2000 & MFD integration guide

BMV-700 Battery Monitor

The BMV-700 Battery Monitor features an advanced microprocessor control system combined with high resolution measuring systems for battery voltage and charge/discharge current. Besides this, the software includes complex calculation algorithms, like Peukert's formula, to exactly determine the state of charge of the battery. The BMV-700 selectively displays battery voltage, current, consumed Ah or time to go. The monitor also stores a host of data regarding performance and use of the battery.

Several models available (see battery monitor documentation).

MULTIPLUS INVERTER/CHARGER
500VA - 2000VA

MultiPlus
500 / 800 / 1200 / 1600 VA

MultiPlus 2000 VA
(bottom cover removed)

Multifunctional, with intelligent power management
The MultiPlus is a powerful true sine wave inverter, a sophisticated battery charger that features adaptive charge technology, and a high-speed AC transfer switch in a single compact enclosure. Next to these primary functions, the MultiPlus has several advanced features, as outlined below.

Parallel operation and three phase capability
Up to six Multis can operate in parallel to achieve higher power output.
In addition to parallel connection, three units can be configured for three-phase output.

PowerControl - Dealing with limited generator, shore side or grid power
With the Multi Control Panel a maximum generator or shore current can be set. The MultiPlus will then take account of other AC loads and use whatever is extra for charging, thus preventing the generator or shore supply from being overloaded.

PowerAssist - Boosting the capacity of shore or generator power
This feature takes the principle of PowerControl to a further dimension. It allows the MultiPlus to supplement the capacity of the alternative source. Where peak power is so often required only for a limited period, the MultiPlus will make sure that insufficient shore or generator power is immediately compensated for by power from the battery. When the load reduces, the spare power is used to recharge the battery.

Four stage adaptive charger and dual bank battery charging for Lithium, Sealed, AGM, Gel and Flooded Batteries

The main output provides a powerful charge to the battery system by means of advanced 'adaptive charge' software. The software fine-tunes the three-stage automatic process to suit the condition of the battery, and adds a fourth stage for long periods of float charging. The adaptive charge process is described in more detail on the Charger datasheet and on our website, under Technical Information. In addition to this, the MultiPlus will charge a second battery using an independent trickle charge output intended for a main engine or generator starter battery.

High start-up power
Needed to start high inrush loads such as power converters for LED lamps, halogen lamps or electric tools.

Search Mode
When Search Mode is 'on', the power consumption of the inverter in no-load operation is decreased by approx. 70 %. In this mode the Multi, when operating in inverter mode, is switched off in case of no load or very low load, and switches on every two seconds for a short period. If the output current exceeds a set level, the inverter will continue to operate. If not, the inverter will shut down again.

Programmable relay
By default, the programmable relay is set as an alarm relay, i.e. the relay will de-energise in the event of an alarm or a pre-alarm (inverter almost too hot, ripple on the input almost too high, battery voltage almost too low).

Remote on / off / charger on
Three pole connector.

On-site system configuring, monitoring and control
After installation, the MultiPlus is ready to go.
Some settings can be changed with DIP switches.
500/800/1200 VA models: remote switch / battery charge voltage / inverter frequency / search mode.
1600/2000 VA models: battery charge voltage / search mode.
For more settings use VE-Config or the VE.Bus Smart dongle.

Remote configuring and monitoring
Install a Cerbo GX or other GX product to connect to the internet.
Operational data can be stored and displayed on our VRM (Victron Remote Management) website, free of charge.
When connected to the internet, systems can be accessed remotely, and settings can be changed.

Ekrano GX or Cerbo GX
Provides intuitive system control and monitoring and enables access to our free remote monitoring website: the VRM Online Portal.

VRM Portal
Our free remote monitoring website (VRM) will display all your system data in a comprehensive graphical format. System settings can be changed remotely via the portal. Alarms can be received by e-mail or push notification.

VRM app
Monitor and manage your Victron Energy system from your smart phone and tablet. Available for both iOS and Android.

12 Volt 24 Volt 48 Volt	MultiPlus 12/500/20 MultiPlus 24/500/10 MultiPlus 48/500/6	MultiPlus 12/800/35 MultiPlus 24/800/16 MultiPlus 48/800/9	MultiPlus 12/1200/50 MultiPlus 24/1200/25 MultiPlus 48/1200/13	MultiPlus 12/1600/70 MultiPlus 24/1600/40 MultiPlus 48/1600/20	MultiPlus 12/2000/80 MultiPlus 24/2000/50 MultiPlus 48/2000/25
PowerControl / PowerAssist	No	Yes	Yes	Yes	Yes
Three Phase and parallel operation	Yes	Yes	Yes	Yes	Yes
Transfer switch	16 A	16 A	16 A	16 A	35 A
INVERTER					
Input voltage range	9,5 – 17 V 19 – 33 V 38– 66 V				
Output	Output voltage: 230 VAC ± 2 % Frequency: 50 Hz ± 0,1 % [1]				
Cont. output power at 25 °C [3]	500 VA	800 VA	1200 VA	1600 VA	2000 VA
Cont. output power at 25 °C	430 W	700 W	1000 W	1300 W	1600 W
Cont. output power at 40 °C	400 W	650 W	900 W	1100 W	1400 W
Cont. output power at 65 °C	300 W	400 W	600 W	800 W	1000 W
Peak power	900 W	1600 W	2400 W	2800 W	3500 W
Maximum efficiency	90 / 91 / 92 %	92 / 93 / 94 %	93 / 94 / 95 %	93 / 94 / 95 %	93 / 94 / 95 %
Zero-load power	6 / 6 / 7 W	7 / 7 / 8 W	10 / 9 / 10 W	10 / 9 / 10 W	10 / 9 / 10 W
Zero-load power in search mode	2 / 2 / 3 W	2 / 2 / 3 W	3 / 3 / 3 W	3 / 3 / 3 W	3 / 3 / 3 W
CHARGER					
AC Input	Input voltage range: 187-265 VAC Input frequency: 45 – 65 Hz				
Charge voltage 'absorption'	14,4 / 28,8 / 57,6 V				
Charge voltage 'float'	13,8 / 27,6 / 55,2 V				
Storage mode	13,2 / 26,4 /52,8 V				
Charge current house battery [4]	20 / 10 / 6 A	35 / 16 / 9 A	50 / 25 / 13 A	70 / 40 / 20 A	80 / 50/ 25 A
Charge current starter battery	1 A (12 V and 24 V models only)				
Battery temperature sensor	Yes				
GENERAL					
Programmable relay [5]	Yes				
Protection [2]	a – g				
VE.Bus communication port	For parallel and three phase operation, remote monitoring and system integration (RJ45-spliter ASS030065510 needed for 500 / 800 / 1200 VA models)				
Remote on-off	On/off/charger only			On/off	
DIP switches	Yes [6]	Yes [6]	Yes [6]	Yes [7]	Yes [7]
Internal DC fuse	125 / 60 /30 A	150 / 80 / 40 A	200 / 100 / 50 A	200 / 125 / 60 A	no
Common Characteristics	Operating temp. range: -40 to +65 °C (fan assisted cooling) Humidity (non-condensing): max 95 %				
ENCLOSURE					
Common Characteristics	Material & Colour: Steel/ABS (blue RAL 5012) Protection category: IP 21				Steel (RAL 5012), IP21
Battery-connection	16 / 10 / 10 mm²	25 / 16 / 10 mm²	35 / 25 / 10 mm²	50 / 35 / 16 mm²	M8 bolts
230 VAC-connection	G-ST18i connector				Screw
Weight	4,4 kg	6,4 kg	8,2 kg	10,2 kg	15,5 kg
Dimensions (h x w x d)	311 x 182 x 100 mm	360 x 240 x 100 mm	406 x 250 x 100 mm	470 x 265 x 120 mm	506 x 236 x 147 mm
STANDARDS					
Safety	EN-IEC 60335-1, EN-IEC 60335-2-29, EN 62109-1				
Emission Immunity	EN 55014-1, EN 55014-2, EN-IEC 61000-3-2, EN-IEC 61000-3-3, IEC 61000-6-1, IEC 61000-6-2, IEC 61000-6-3				
Automotive Directive	ECE R10-5				

1) Can be adjusted to 60Hz and to 240V
2) Protection:
a. Output short circuit
b. Overload
c. Battery voltage too high
d. Battery voltage too low
e. Temperature too high
f. 230 VAC on inverter output
g. Input voltage ripple too high

3) Non-linear load, crest factor 3:1
4) Up to 25 °C ambient
5) Programmable relay which can be set for:
general alarm, DC under voltage or generator start/stop signal function
AC rating: 230 V/4 A
DC rating: 4 A up to 35 VDC, 1 A up to 60 VDC
6) Remote / battery charge voltage / inverter frequency / search mode
7) Battery charge voltage / search mode

Digital Multi Control Panel
A convenient and low-cost solution for monitoring and control. With an on/off charger-only switch, full LED readout and a rotary knob to set PowerControl and PowerAssist levels.

VE.Bus Smart Dongle
For monitoring and control via Bluetooth together with the VictronConnect app. It also measures battery voltage and temperature.

Interface MK3-USB
Needed to configure the MultiPlus, Can be used with the VictronConnect app or VE.Configure software. The interface connects to the MultiPlus via an RJ45 UTP cable and plugs into a USB port.

VictronConnect app
Use to monitor or configure the MultiPlus using your phone tablet or PC.

Battery Monitor
To monitor battery state of charge via Bluetooth or the VRM portal.
The BMV 712 Smart has display, while the SmartShunt does not have a display. Both communicate via Bluetooth and have a VE.Direct communication port.

MULTIPLUS INVERTER/CHARGER
800VA - 5KVA 230V

Lithium Ion battery compatible

MultiPlus Compact 12/2000/80

MultiPlus 24/3000/70

Two AC Outputs
The main output has no break functionality. The MultiPlus takes over the supply to the connected loads in the event of a grid failure or when shore/generator power is disconnected. This happens so fast (less than 20 milliseconds) that computers and other electronic equipment will continue to operate without disruption.
The second output is live only when AC is available on the input of the MultiPlus. Loads that should not discharge the battery, like a water heater for example can be connected to this output (second output available on models rated at 3 kVA and more).

Virtually unlimited power thanks to parallel operation
Up to 6 Multis can operate in parallel to achieve higher power output. Six 24/5000/120 units, for example, will provide 25 kW / 30 kVA output power with 720 Amps charging capacity.

Three phase capability
In addition to parallel connection, three units of the same model can be configured for three phase output. But that's not all: up to 6 sets of three units can be parallel connected for a 75 kW / 90 kVA inverter and more than 2000 Amps charging capacity.

PowerControl - Dealing with limited generator, shore side or grid power
The MultiPlus is a very powerful battery charger. It will therefore draw a lot of current from the generator or shore side supply (nearly 10 A per 5 kVA Multi at 230 VAC). With the Multi Control Panel a maximum generator or shore current can be set. The MultiPlus will then take account of other AC loads and use whatever is extra for charging, thus preventing the generator or shore supply from being overloaded.

PowerAssist - Boosting the capacity of shore or generator power
This feature takes the principle of PowerControl to a further dimension. It allows the MultiPlus to supplement the capacity of the alternative source. Where peak power is so often required only for a limited period, the MultiPlus will make sure that insufficient shore or generator power is immediately compensated for by power from the battery. When the load reduces, the spare power is used to recharge the battery.

Solar energy: AC power available even during a grid failure
The MultiPlus can be used in off grid as well as grid connected PV and other alternative energy systems.
Loss of mains detection software is available.

System configuring
- In case of a stand-alone application, if settings have to be changed, this can be done in a matter of minutes with a DIP switch setting procedure.
- Parallel and three phase applications can be configured with VE.Bus Quick Configure and VE.Bus System Configurator software.
- Off grid, grid interactive and self-consumption applications, involving grid-tie inverters and/or MPPT Solar Chargers can be configured with Assistants (dedicated software for specific applications).

On-site Monitoring and control
Several options are available: Battery Monitor, Multi Control Panel, Color Control GX or other GX devices, smartphone or tablet (Bluetooth Smart), laptop or computer (USB or RS232).

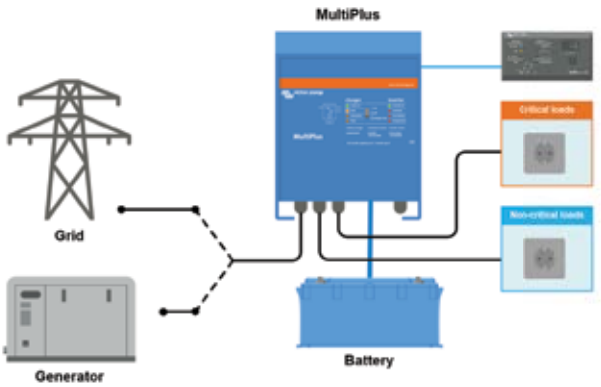
Remote Monitoring and control
Color Control GX or other GX devices.
Data can be stored and displayed on our VRM (Victron Remote Management) website, free of charge.

Remote configuring
When connected to the Ethernet, systems with a Color Control GX or other GX device can be accessed and settings can be changed remotely.

Ekrano GX or Cerbo GX
Provides intuitive system control and monitoring and enables access to our free remote monitoring website: the VRM Online Portal.

VRM Portal
Our free remote monitoring website (VRM) will display all your system data in a comprehensive graphical format. System settings can be changed remotely via the portal. Alarms can be received by e-mail or push notification.

VRM app
Monitor and manage your Victron Energy system from your smart phone and tablet. Available for both iOS and Android.



Standard marine, mobile or off-grid application
Loads that should shut down when AC input power is not available can be connected to a second output (not shown). These loads will be considered by the PowerControl and PowerAssist function in order to limit AC input current to a safe value when AC power is available.

MultiPlus 12 Volt 24 Volt 48 Volt	C 12/800/35 C 24/ 800/16	C 12/1200/50 C 24/1200/25	C 12/1600/70 C 24/1600/40	C 12/2000/80 C 24/2000/50	12/3000/120 24/3000/70 48/3000/35	24/5000/120 48/5000/70
Nominal Battery voltage	12 V battery 24 V battery	12 V battery 24 V battery	12 V battery 24 V battery	12 V battery 24 V battery	12 V battery 24 V battery 48 V battery	24 V battery 48 V battery
PowerControl	Yes	Yes	Yes	Yes	Yes	Yes
PowerAssist	Yes	Yes	Yes	Yes	Yes	Yes
AC input	Input voltage range: 187-250 V Input frequency: 50/60 Hz Cos Φ >0.8					
Transfer switch (A)	16	16	16	30	16 or 50	100
INVERTER						
Input voltage range (VDC)	9,5 – 17 V 19 – 33 V 38 – 66 V					
Input current (A DC)	n. a.	n. a.	n. a.	n. a.	250 / 125 / 65	238 / 118
Output	Output voltage: 230 VAC ± 2 % Frequency: 50 Hz ± 0,1 % [1]					
Cont. output power at 25 °C (VA) [3]	800	1200	1600	2000	3000	5000
Cont. output power at 25 °C (W)	700	1000	1300	1600	2400	4000
Cont. output power at 40 °C (W)	650	900	1200	1400	2200	3700
Cont. output power at 65 °C (W)	400	600	800	1000	1700	3000
Peak power (W)	1600	2400	3000	4000	6000	10.000
Maximum continuous Output current (A~)	n. a.	n. a.	n. a.	n. a.	11	19
Power factor range	n. a.	n. a.	n. a.	n. a.	±0.8	±0.8
Maximum output fault current	n. a.	n. a.	n. a.	n. a.	32A peak 1 sec.	53A peak 1sec
Maximum efficiency (%)	92 / 94	93 / 94	93 / 94	93 / 94	93 / 94 / 95	94 / 95
Zero load power (W)	8 / 10	8 / 10	8 / 10	9 / 11	20 / 20 / 25	30 / 35
Zero load power in AES mode (W)	5 / 8	5 / 8	5 / 8	7 / 9	15 / 15 / 20	25 / 30
Zero load power in Search mode (W)	2 / 3	2 / 3	2 / 3	3 / 4	8 / 10 / 12	10 / 15
CHARGER						
AC Input	Input voltage range: 187-265 VAC Input frequency: 45 – 65 Hz Power factor: 1					
Charge voltage 'absorption' (VDC)	14,4 / 28,8 / 57,6					
Charge voltage 'float' (VDC)	13,8 / 27,6 / 55,2					
Storage mode (VDC)	13,2 / 26,4 / 52,8					
Charge current house battery (A) [4]	35 / 16	50 / 25	70 / 40	80 / 50	120 / 70 / 35	120 / 70
Charge current starter battery (A)	4 (12 V and 24 V models only)					
Battery temperature sensor	yes					
GENERAL						
Auxiliary output [5]	n. a.	n. a.	n. a.	n. a.	Yes (16A)	Yes (50A)
Programmable relay [6]	Yes					
Protection [2]	a - g					
VE.Bus communication port	For parallel and three phase operation, remote monitoring and system integration					
General purpose com. port	n. a.	n. a.	n. a.	n. a.	Yes	Yes
Remote on-off	Yes					
Common Characteristics	Operating temp. range: -40 to +65 °C (fan assisted cooling) Humidity (non-condensing): max 95 %					
Maximum altitude	2000 m.					
ENCLOSURE						
Common Characteristics	Material & Colour: aluminium (blue RAL 5012), Protection category: IP20, pollution degree 2, OVCIII Icw: 6kA 30mS					
Battery-connection	battery cables of 1.5 meter			M8 bolts	Four M8 bolts (2 plus and 2 minus connections)	
230 VAC-connection	G-ST18i connector			Spring-clamp	Screw terminals 13 mm² (6 AWG)	M6 bolts
Weight (kg)	10	10	10	12	18	30
Dimensions (hxwxd in mm)	375 x 214 x 110			520 x 255 x 125	362 x 258 x 218	444 x 328 x 240
STANDARDS						
Safety	EN-IEC 60335-1, EN-IEC 60335-2-29, IEC 62109-1					
Emission, Immunity	EN 55014-1, EN 55014-2, EN-IEC 61000-3-2, EN-IEC 61000-3-3, IEC 61000-6-1, IEC 61000-6-2, IEC 61000-6-3					
Road vehicles	12 V and 24 V models: ECE R10-4					
Anti-islanding	See our website					

1) Can be adjusted to 60 HZ. 120 V models available on request
2) Protection key:
a) output short circuit
b) overload
c) battery voltage too high
d) battery voltage too low
e) temperature too high
f) 230 VAC on inverter output
g) input voltage ripple too high

3) Non-linear load, crest factor 3:1
4) Up to 25 °C ambient
5) Switches off when no external AC source available
6) Programmable relay that can a.o. be set for general alarm,
DC under voltage or genset start/stop function
AC rating: 230 V/4 A
DC rating: 4 A up to 35 VDC, 1 A up to 60 VDC
7) A.o. to communicate with a Lithium-Ion battery BMS

Digital Multi Control Panel
A convenient and low-cost solution for monitoring and control. With an on/off charger-only switch, full LED readout and a rotary knob to set PowerControl and PowerAssist levels.

VE.Bus Smart Dongle
For monitoring and control via Bluetooth together with the VictronConnect app. It also measures battery voltage and temperature.

Interface MK3-USB
Needed to configure the MultiPlus, Can be used with the VictronConnect app or VE.Configure software. The interface connects to the MultiPlus via an RJ45 UTP cable and plugs into a USB port.

VictronConnect app
Use to monitor or configure the MultiPlus using your phone tablet or PC.

Battery Monitor
To monitor battery state of charge via Bluetooth or the VRM portal.
The BMV 712 Smart has display, while the SmartShunt does not have a display. Both communicate via Bluetooth and have a VE.Direct communication port.

MULTIPLUS INVERTER/CHARGER
2KVA AND 3KVA 120V

MultiPlus
24/3000/70

MultiPlus Compact
12/2000/80

Ekrano GX or Cerbo GX
Provides intuitive system control and monitoring and enables access to our free remote monitoring website: the VRM Online Portal.

VRM Portal and app
Our free remote monitoring website (VRM) will display all your system data in a comprehensive graphical format. System settings can be changed remotely via the portal. Alarms can be received by e-mail or push notification.

Multifunctional, with intelligent power management
The MultiPlus is a powerful true sine wave inverter, a sophisticated battery charger that features adaptive charge technology, and a high-speed AC transfer switch in a single compact enclosure. Next to these primary functions, the MultiPlus has several advanced features, as outlined below.

Two AC Outputs
The main output has no-break functionality. The MultiPlus takes over the supply to the connected loads in the event of a grid failure or when shore-/generator power is disconnected. This happens so fast (less than 20 milliseconds) that computers and other electronic equipment will continue to operate without disruption.
The second output is live only when AC is available on the input of the MultiPlus. Loads that should not discharge the battery, like a water heater for example, can be connected to this output (second output available on models rated at 3 kVA and more).

Virtually unlimited power thanks to parallel operation
Up to six Multis can operate in parallel to achieve higher power output. Six 24/3000/70 units, for example, provide 15 kW / 18 kVA output power with 420 Amps of charging capacity.

Three phase capability
In addition to parallel connection, three units can be configured for three-phase output. But that's not all: with three strings of six parallel units a 45 kW / 54 kVA three phase inverter and 1260 A charger can be built.

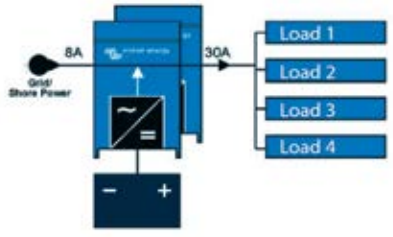
Split phase options
Two units can be stacked to provide 120-0-120 V, and additional units can be paralleled up to a total of 6 units per phase, to supply up to 30 kW / 36 kVA of split phase power.
Alternatively, a split phase AC source can be obtained by connecting our autotransformer (see data sheet on www.victronenergy.com) to a 'European' inverter programmed to supply 240 V / 60 Hz.

PowerControl - Dealing with limited generator, shore side or grid power
The MultiPlus is a very powerful battery charger. It will therefore draw a lot of current from the generator or shore side supply (nearly 20 A per 3 kVA MultiPlus at 120 VAC). With the Multi Control Panel a maximum generator or shore current can be set. The MultiPlus will then take account of other AC loads and use whatever is extra for charging, thus preventing the generator or shore supply from being overloaded.

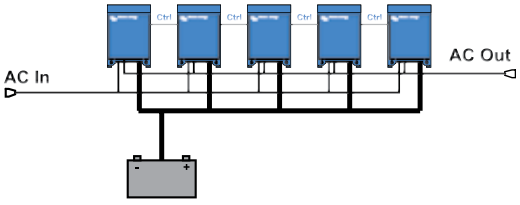
PowerAssist - Boosting the capacity of shore or generator power
This feature takes the principle of PowerControl to a further dimension. It allows the MultiPlus to supplement the capacity of the alternative source. Where peak power is so often required only for a limited period, the MultiPlus will make sure that insufficient shore or generator power is immediately compensated for by power from the battery. When the load reduces, the spare power is used to recharge the battery.

Four stage adaptive charger and dual bank battery charging
The main output provides a powerful charge to the battery system by means of advanced 'adaptive charge' software. The software fine-tunes the three-stage automatic process to suit the condition of the battery, and adds a fourth stage for long periods of float charging. The adaptive charge process is described in more detail on the Charger datasheet and on our website, under Technical Information. In addition to this, the MultiPlus will charge a second battery using an independent trickle charge output intended for a main engine or generator starter battery.

System configuring has never been easier
After installation, the MultiPlus is ready to go.
If settings have to be changed, this can be done in a matter of minutes with a DIP switch setting procedure. Even parallel and 3-phase operation can be programmed with DIP switches: no computer needed!
Alternatively, VE.Net can be used instead of the DIP switches.
And sophisticated software (VE.Bus Quick Configure and VE.Bus System Configurator) is available to configure several new, advanced, features.



PowerAssist with 2x MultiPlus in parallel



Five parallel units: output power 12,5 kW

MultiPlus	12 Volt 24 Volt	12/2000/80 24/2000/50	12/3000/120 24/3000/70
PowerControl		Yes	
PowerAssist		Yes	
Transfer switch (A)		50	
Parallel and 3-phase operation		Yes	
INVERTER			
Input voltage range (VDC)		9,5 – 17 V	19 – 33 V
Output		Output voltage: 120 VAC ± 2 %	Frequency: 60 Hz ± 0,1 % [1]
Cont. output power at 25 °C / 77 °F (VA) [3]		2000	3000
Cont. output power at 25 °C / 77 °F (W)		1600	2400
Cont. output power at 40 °C / 104 °F (W)		1450	2200
Cont. output power at 65 °C / 150 °F (W)		1100	1700
Peak power (W)		4000	6000
Maximum efficiency (%)		92 / 94	93 / 94
Zero load power (W)		9 / 11	20 / 20
Zero load power in AES mode (W)		7 / 8	15 / 15
Zero load power in Search mode (W)		3 / 4	8 / 10
CHARGER			
AC Input		Input voltage range: 95-140 VAC	Input frequency: 45 – 65 Hz Power factor: 1
Charge voltage 'absorption' (VDC)		14,4 / 28,8	
Charge voltage 'float' (VDC)		13,8 / 27,6	
Storage mode (VDC)		13,2 / 26,4	
Charge current house battery (A) [4]		80 / 50	120 / 70
Charge current starter battery (A)		4	
Battery temperature sensor		yes	
GENERAL			
Auxiliary output [5]		n. a.	Yes (32 A)
Programmable relay [6]		Yes (1x)	Yes (3x)
Protection [2]		a - g	
VE.Bus communication port		For parallel and three phase operation, remote monitoring and system integration	
General purpose com. port [7]		n. a.	Yes (2x)
Remote on-off		Yes	
Common Characteristics		Operating temp. range: -40 - +65 °C / -40 to 150 °F (fan assisted cooling)	Humidity (non-condensing): max 95%
ENCLOSURE			
Common Characteristics		Material & Colour: aluminium (blue RAL 5012)	Protection category: IP 21
Battery-connection		M8 bolts	M8 bolts (2 plus and 2 minus connections)
120 V AC-connection		Screw-terminal 6 AWG (13 mm²)	Screw-terminal 6 AWG (13mm²)
Weight		13 kg 25 lbs.	19kg 40 lbs.
Dimensions (hxwxd in mm and inches)		520x255x125 mm 20.5x10.0x5.0 inch	362x258x218 mm 14.3x10.2x8.6 inch
STANDARDS			
Safety		UL 458, EN-IEC 60335-1, EN-IEC 60335-2-29	UL 1741, UL 458, EN-IEC 60335-1, EN-IEC 60335-2-29
Emission and Immunity		EN-IEC 61000-3-2/3-3/, EN-IEC 61000-6-1/6-2/6-3	EN-IEC 61000-3-2/3-3/, EN-IEC 61000-6-1/6-2/6-3

1) Can be adjusted to 50 HZ;
2) Protection key:
   a) output short circuit
   b) overload
   c) battery voltage too high
   d) battery voltage too low
   e) temperature too high
   f) 120 VAC on inverter output
   g) input voltage ripple too high
3) Non-linear load, crest factor 3:1
4) Up to 75 °F ambient
5) Switches off when no external AC source available
6) Programmable relay that can a.o. be set for general alarm,
   DC under voltage or genset start/stop function
   AC rating: 120 V/4 A
   DC rating: 4 A up to 35 VDC, 1 A up to 60 VDC
7) A.o. to communicate with a Lithium Ion battery BMS

Digital Multi Control Panel
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VE.Bus Smart Dongle
For monitoring and control via Bluetooth together with the VictronConnect app. It also measures battery voltage and temperature.

Interface MK3-USB
Needed to configure the MultiPlus, Can be used with the VictronConnect app or VE.Configure software. The interface connects to the MultiPlus via an RJ45 UTP cable and plugs into a USB port.

VictronConnect app
Use to monitor or configure the MultiPlus using your phone tablet or PC.

Battery Monitor
To monitor battery state of charge via Bluetooth or the VRM portal.
The BMV 712 Smart has display, while the SmartShunt does not have a display. Both communicate via Bluetooth and have a VE.Direct communication port.

QUATTRO INVERTER/CHARGER
3KVA - 15KVA 230V

Lithium Ion battery compatible

Quattro
48/5000/70-100/100

Quattro
48/15000/200-100/100

Ekrano GX or Cerbo GX
Provides intuitive system control and monitoring and enables access to our free remote monitoring website: the VRM Online Portal.

Two AC inputs with integrated transfer switch
The Quattro can be connected to two independent AC sources, for example the public grid and a generator, or two generators. The Quattro will automatically connect to the active source.

Two AC Outputs
The main output has no-break functionality. The Quattro takes over the supply to the connected loads in the event of a grid failure or when shore/generator power is disconnected. This happens so fast (less than 20 milliseconds) that computers and other electronic equipment will continue to operate without disruption.
The second output is live only when AC is available on one of the inputs of the Quattro. Loads that should not discharge the battery, like a water heater for example, can be connected to this output.

Split phase option
A split phase AC source can be obtained by connecting our autotransformer (see data sheet on www.victronenergy.com) to a 'European' inverter programmed to supply 240 V / 60 Hz.

Three phase capability
Three units can be configured for three phase output. But that's not all: up to 4 sets of three 15 kVA units can be parallel connected to provide 144 kW / 180 kVA inverter power and 2400 A charging capacity.

PowerControl – Dealing with limited generator, shore side or grid power
The Quattro is a very powerful battery charger. It will therefore draw a lot of current from the generator or shore side supply (16 A per 5 kVA Quattro at 230 VAC). A current limit can be set on each AC input. The Quattro will then take account of other AC loads and use whatever is spare for charging, thus preventing the generator or mains supply from being overloaded.

PowerAssist – Boosting shore or generator power
This feature takes the principle of PowerControl to a further dimension allowing the Quattro to supplement the capacity of the alternative source. Where peak power is so often required only for a limited period, the Quattro will make sure that insufficient mains or generator power is immediately compensated for by power from the battery. When the load reduces, the spare power is used to recharge the battery.

Solar energy: AC power available even during a grid failure
The Quattro can be used in off grid as well as grid connected PV and other alternative energy systems.
Loss of mains detection software is available.

System configuring
- In case of a stand-alone application, if settings have to be changed, this can be done in a matter of minutes with a DIP switch setting procedure.
- Parallel and three phase applications can be configured with VE.Bus Quick Configure and VE.Bus System Configurator software.
- Off grid, grid interactive and self-consumption applications, involving grid-tie inverters and/or MPPT Solar Chargers can be configured with Assistants (dedicated software for specific applications).

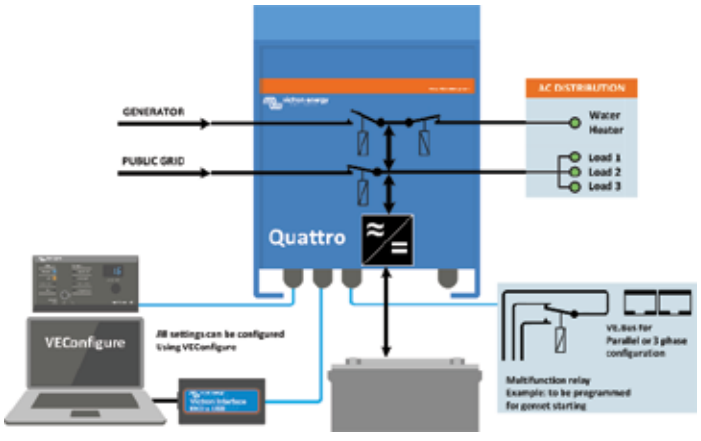
On-site Monitoring and control
Several options are available: Battery Monitor, Multi Control Panel, Color Control GX or other GX devices, smartphone or tablet (Bluetooth Smart), laptop or computer (USB or RS232).

Remote Monitoring and control
Color Control GX or other GX devices.
Data can be stored and displayed on our VRM (Victron Remote Management) website, free of charge.

Remote configuring
When connected to the Ethernet, systems with a Color Control GX or other GX device can be accessed and settings can be changed remotely.

VRM Portal
Our free remote monitoring website (VRM) will display all system data in a comprehensive graphical format. System settings can be changed remotely via the portal. Alarms can be received by e-mail or push notification.

VRM app
Monitor and manage your Victron Energy system from your smart phone and tablet. Available for both iOS and Android.



Quattro	12/3000/120-50/50 24/3000/70-50/50	12/5000/220-100/100 24/5000/120-100/100 48/5000/70-100/100	24/8000/200-100/100 48/8000/110-100/100	48/10000/140-100/100	48/15000/200-100/100
Nominal Battery Voltage	12/3000: 12 V battery 24/3000: 24 V battery	12/5000: 12 V battery 24/5000: 24 V battery 48/5000: 48 V Batttery	24/8000: 24 V battery 48/8000: 48 V battery	48 V battery	
PowerControl / PowerAssist	Yes				
Integrated Transfer switch	Yes				
AC inputs (2x)	Input voltage range: 187-250 VAC Input frequency: 50/60 Hz Cos Φ >0.8				
Maximum feed through current (A)	2x 50	2x100	2x100	2x100	2x100
ICw	6 kA 30 mS	10 kA 30 ms			
INVERTER					
Input voltage range (VDC)	9,5 – 17 V 19 – 33 V 38 – 66 V				
Output [1]	Output voltage: 230 VAC ± 2 % Frequency: 50 Hz ± 0,1 %				
Cont. output power at 25 °C (VA) [3]	3000	5000	8000	10000	15000
Cont. output power at 25 °C (W)	2400	4000	6400	8000	12000
Cont. output power at 40 °C (W)	2200	3700	5500	6500	10000
Cont. output power at 65 °C (W)	1700	3000	3600	4500	7000
Peak power (W)	6000	10000	16000	20000	25000
Input current (A DC)	250 / 125	458/238/118	381/188	235	350
Maximum continuous Output current (A~)	11	19	30	37	53/50
Power factor range	±0.8	±0.8	±0.8	±0.8	±0.8
Maximum output fault current	32 A peak 1 sec.	53 A 1 sec.	100 A 1 sec	100 A 1 sec	150 A 1 sec
Maximum efficiency (%)	93 / 94	94 / 94 / 95	94 / 96	96	96
Zero load power (W)	20 / 20	30 / 30 / 35	60 / 60	60	110
Zero load power in AES mode (W)	15 / 15	20 / 25 / 30	40 / 40	40	75
Zero load power in Search mode (W)	8 / 10	10 / 10 / 15	15 / 15	15	20
CHARGER					
Charge voltage 'absorption' (VDC)	14,4 / 28,8	14,4 / 28,8 / 57,6	28,8 / 57,6	57,6	57,6
Charge voltage 'float' (VDC)	13,8 / 27,6	13,8 / 27,6 / 55,2	27,6 / 55,2	55,2	55,2
Storage mode (VDC)	13,2 / 26,4	13,2 / 26,4 / 52,8	26,4 / 52,8	52,8	52,8
Charge current house battery (A) [4]	120 / 70	220 / 120 / 70	200 / 110	140	200
Charge current starter battery (A)	4 (12 V and 24 V models only)				
Battery temperature sensor	Yes				
GENERAL					
Auxiliary output (A) [5]	25	50	50	50	50
Programmable relay [6]	3x	3x	3x	3x	3x
Protection [2]	a-g				
VE.Bus communication port	For parallel and three phase operation, remote monitoring and system integration				
General purpose com. port	2x	2x	2x	2x	2x
Remote on-off	Yes				
Common Characteristics	Operating temp.: -20 to +60 °C Humidity (non-condensing): max. 95 %				
Maximum altitude	2000 m				
ENCLOSURE					
Common Characteristics	Material & Colour: aluminium (blue RAL 5012) Protection category: IP20, pollution degree 2, OVC III				
Battery-connection	Four M8 bolts (2 plus and 2 minus connections)				
230 VAC-connection	Screw terminals 13 mm² (6 AWG)	Bolts M6	Bolts M6	Bolts M6	Bolts M6
Weight (kg)	19	34 / 30 / 30	45 / 41	51	72
Dimensions (hxwxd in mm)	362 x 258 x 218	470 x 350 x 280 444 x 328 x 240 444 x 328 x 240	470 x 350 x 280	470 x 350 x 280	572 x 488 x 344
STANDARDS					
Safety	EN-IEC 60335-1, EN-IEC 60335-2-29, EN-IEC 62109-1				
Emission, Immunity	EN 55014-1, EN 55014-2, EN-IEC 61000-3-2, EN-IEC 61000-3-3, IEC 61000-6-1, IEC 61000-6-2, IEC 61000-6-3				
Road vehicles	12 V and 24 V models: ECE R10-4				
Anti-islanding	See our website				

1) Can be adjusted to 60 HZ. 120 V models available on request
2) Protection key:
a) output short circuit
b) overload
c) battery voltage too high
d) battery voltage too low
e) temperature too high
f) 230 VAC on inverter output
g) input voltage ripple too high

3) Non-linear load, crest factor 3:1
4) Up to 25 °C ambient
5) Switches off when no external AC source available
6) Programmable relay that can a.o. be set for general alarm, DC under voltage or genset start/stop function
AC rating: 230 V / 4 A
DC rating: 4 A up to 35 VDC, 1 A up to 60 VDC

Digital Multi Control Panel
A convenient and low-cost solution for monitoring and control. With an on/off charger-only switch, full LED readout and a rotary knob to set PowerControl and PowerAssist levels.

VE.Bus Smart Dongle
For monitoring and control via Bluetooth together with the VictronConnect app. It also measures battery voltage and temperature.

Interface MK3-USB
Needed to configure the MultiPlus, Can be used with the VictronConnect app or VE.Configure software. The interface connects to the MultiPlus via an RJ45 UTP cable and plugs into a USB port.

VictronConnect app
Use to monitor or configure the MultiPlus using your phone tablet or PC.

Battery Monitor
To monitor battery state of charge via Bluetooth or the VRM portal. The BMV 712 Smart has display, while the SmartShunt does not have a display. Both communicate via Bluetooth and have a VE.Direct communication port.

QUATTRO INVERTER/CHARGER
3KVA - 10KVA 120V

Quattro
48/5000/70-100/100

Ekrano GX or Cerbo GX
Provides intuitive system control and monitoring and enables access to our free remote monitoring website: the VRM Online Portal.

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Monitor and manage your Victron Energy system from your smart phone and tablet. Available for both iOS and Android.

Two AC inputs with integrated transfer switch
The Quattro can be connected to two independent AC sources, for example the public grid and a generator, or two generators. The Quattro will automatically connect to the active source.

Two AC Outputs
The main output has no-break functionality. The Quattro takes over the supply to the connected loads in the event of a grid failure or when shore/generator power is disconnected. This happens so fast (less than 20 milliseconds) that computers and other electronic equipment will continue to operate without disruption.
The second output is live only when AC is available on one of the inputs of the Quattro. Loads that should not discharge the battery, like a water heater for example, can be connected to this output.

Split phase and three phase capability
Two units can be configured for split phase, and three units can be configured for three phase output. But that's not all: up to 4 sets of three units can be parallel connected to provide 96W / 120kVA inverter power and more than 1600A charging capacity. For more detail please enter *parallel* in the search box on our website.

PowerControl – Dealing with limited generator, shore side or grid power
A current limit can be set on each AC input. The Quattro will then take account of other AC loads and use whatever is spare for charging, thus preventing the generator or mains supply from being overloaded.

PowerAssist – Boosting shore or generator power
This feature takes the principle of PowerControl to a further dimension allowing the Quattro to supplement the capacity of the alternative source. Where peak power is so often required only for a limited period, the Quattro will make sure that insufficient mains or generator power is immediately compensated for by power from the battery. When the load reduces, the spare power is used to recharge the battery.

Solar energy: AC power available even during a grid failure
The Quattro can be used in off grid as well as grid connected PV and other alternative energy systems.
Loss of mains detection software is available.

System configuring
- In case of a stand-alone application, if settings have to be changed, this can be done in a matter of minutes with a DIP switch setting procedure.
- Parallel and three phase applications can be configured with VE.Bus Quick Configure and VE.Bus System Configurator software.
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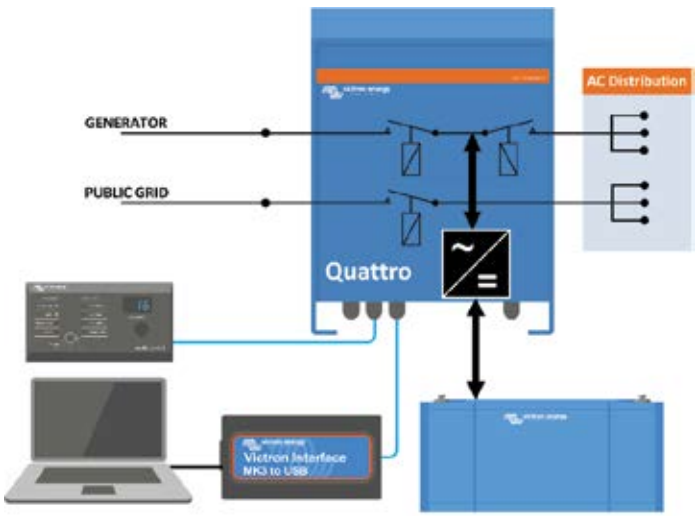

Quattro	48/3000/35-50/50 120V	12/5000/220-100/100 120V 24/5000/120-100/100 120V 48/5000/70-100/100 120V	48/10000/140-100/100 120V
PowerControl / PowerAssist	Yes		
Integrated Transfer switch	Yes		
AC inputs (2x)	Input voltage range: 90-140 VAC Input frequency: 45 – 65 Hz Power factor: 1		
Maximum feed through current	2x 50 A	2x 100 A	2x 100 A
INVERTER			
Input voltage range	9,5 – 17 V 19 – 33V 38 – 66 V		
Output (1)	Output voltage: 120 VAC ± 2 % Frequency: 60 Hz ± 0,1 %		
Cont. output power at 25 °C (3)	3000 VA	5000 VA	10000 VA
Cont. output power at 25 °C	2400 W	4000 W	8000 W
Cont. output power at 40 °C	2200 W	3700 W	6500 W
Cont. output power at 65 °C	1700 W	3000 W	4500 W
Peak power	6000 W	10000 W	20000 W
Maximum efficiency	94 %	94 / 94 / 95 %	96 %
Zero load power	25 W	30 / 30 / 35 W	60 W
Zero load power in AES mode	20 W	20 / 25 / 30 W	40 W
Zero load power in Search mode	12 W	10 / 10 / 15 W	15 W
CHARGER			
Charge voltage 'absorption' (V DC)	57,6 V	14,4 / 28,8 / 57,6 V	57,6 V
Charge voltage 'float' (V DC)	55,2 V	13,8 / 27,6 / 55,2 V	55,2 V
Storage mode (V DC)	52,8 V	13,2 / 26,4 / 52,8 V	52,8 V
Charge current house battery (A) (4)	35 A	200 / 120 / 70 A	140 A
Charge current starter battery (A)	4 A (12 V and 24 V models only)		
Battery temperature sensor	Yes		
GENERAL			
Auxiliary output (5)	32 A	50 A	50 A
Programmable relay (6)	3x		
Protection (2)	a-g		
VE.Bus communication port	For parallel, split phase and three phase operation, remote monitoring and system integration		
General purpose com. port	2x		
Remote on-off	Yes		
Common Characteristics	Operating temp.: -40 to +65 °C Humidity (non-condensing): max. 95 %		
ENCLOSURE			
Common Characteristics	Material & Colour: aluminium (blue RAL 5012) Protection category: IP 21		
Battery-connection	Four M8 bolts (2 plus and 2 minus connections)		
120 V AC-connection	Screw terminals 13 mm² (6 AWG)	Bolts M6	Bolts M6
Weight (kg)	42 lb 19 kg	75 / 66 / 66 lb 34 / 30 / 30 kg	128 lb 58 kg
Dimensions (hxwxd)	14.3 x 10.2 x 8.6 inch 362 x 258 x 218 mm	18,5 x 14,0 x 11,2 inch 470 x 350 x 280 mm 17,5 x 13,0 x 9,6 inch 444 x 328 x 240 mm 17,5 x 13,0 x 9,6 inch 444 x 328 x 240 mm	22.6 x 19,2 x 13,6 inch 572 x 488 x 344 mm
STANDARDS			
Safety	EN-IEC 60335-1, EN-IEC 60335-2-29, EN-IEC 62109-1, UL 1741 (only for 48V 5kVA and 10kVA)		
Emission, Immunity	EN 55014-1, EN 55014-2, EN-IEC 61000-3-2, EN-IEC 61000-3-3, IEC 61000-6-1, IEC 61000-6-2, IEC 61000-6-3		
Road vehicles	12 V and 24 V models: ECE R10-5		
Anti-islanding	See our website		

1) Can be adjusted to 60 HZ; 120 V 60 Hz on request
2) Protection key:
   a) output short circuit
   b) overload
   c) battery voltage too high
   d) battery voltage too low
   e) temperature too high
   f) 120 VAC on inverter output
   g) input voltage ripple too high

3) Non-linear load, crest factor 3:1
4) Up to 25 °C ambient
5) Switches off when no external AC source available
6) Programmable relay that can a.o. be set for general alarm, DC under voltage or genset start/stop function
   AC rating: 230 V / 4 A
   DC rating: 4 A up to 35 VDC, 1 A up to 60 VDC

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To monitor battery state of charge via Bluetooth or the VRM portal.
The BMV 712 Smart has display, while the SmartShunt does not have a display. Both communicate via Bluetooth and have a VE.Direct communication port.

BLUE SMART IP22 CHARGER

Blue Smart IP22
12/30 (3)

Graph screen

One of the history screens

Bluetooth Smart
The wireless solution to monitor voltage and current, to change settings and to update the charger when new features become available.

High efficiency
With up to 94 % efficiency, these chargers generate up to four times less heat when compared to the industry standard.
And once the battery is fully charged, power consumption reduces to 0,5 Watt, some five to ten times better than the industry standard.

Adaptive 6-stage charge algorithm: test - bulk – absorption - recondition – float – storage
The Blue Smart Charger features a microprocessor controlled 'adaptive' battery management. The adaptive feature will automatically optimize the charging process relative to the way the battery is being used.

Fully programmable charge algorithm
Absorption, Float and Storage voltages as well as the Recondition setting and the temperature compensation value can be programmed with the Bluetooth app.
After enabling the Expert mode, the app allows changing practically all parameters and time limits used by the charge algorithm.

Storage Mode: less maintenance and aging when the battery is not in use
The storage mode kicks in whenever the battery has not been subjected to discharge for 24 hours. In the storage mode float voltage is reduced to 2,2 V/cell (13,2 V for a 12 V battery) to minimize gassing and corrosion of the positive plates. Once a week the voltage is raised back to the absorption level to 'equalize' the battery. This feature prevents stratification of the electrolyte and sulfation, which are major causes of early battery failure.

Also charges Li-ion batteries
Li-ion batteries are charged with a simple bulk – absorption – float algorithm.

Fully discharged battery recovery function
Will initiate charging even if the battery has been discharged to zero volts.
Will reconnect to a fully discharged Li-ion battery with internal disconnect function.

NIGHT and LOW setting
When in NIGHT or LOW mode, the output current is reduced to max. 50 % of the nominal output and the charger will be totally noiseless. The NIGHT mode automatically ends after 8 hours. The LOW mode can be ended manually.

Protected against overheating
Output current will reduce as temperature increases up to 50 °C, but the Blue Smart Charger will not fail.

Eleven LEDs for status indication
Charge algorithm: TEST / BULK / ABSORPTION / RECONDITION / FLOAT / STORAGE / READY.
MODE button to set: NORMAL (14,4 V) / HIGH (14,7 V) / RECONDITION / LI-ION.

Forty cycle history log
The history screen contains historical usage data over the charger's lifetime and detailed statistics for the last 40 charge cycles.

VE.Smart Networking
The VE.Smart Network is a wireless device to device (D2D) communication network between Victron products, using Bluetooth Smart.

Optional battery voltage and temperature compensation, and current sensing
The VE.Smart Network opens the possibility to optimize the charge process: a Smart Battery Sense, Smart Battery Monitor or a SmartShunt can be used to communicate battery voltage and temperature to one or more battery chargers. A Smart Battery Monitor or SmartShunt will also communicate battery current.

Synchronized parallel charging
Synchronize up to ten battery chargers in a VE.Smart network to make them charge a battery as if they were one large charger. The chargers will synchronize the charge algorithm between them. They will simultaneously switch from one charge state to another, for example from bulk to absorption.
Synchronized parallel charging has several interesting advantages:

- Redundancy: if one charger stops for whatever reason, the other chargers will continue to operate.
- Flexibility: simply add a charger to the network if more current is needed.
- Cost: several low power chargers will in general cost less than one high power charger.
- Installation: several low power chargers may be easier to fit in a confined space.

BLUE SMART IP67 CHARGER

Blue Smart IP67 Charger 12/25

Bluetooth Smart enabled
The Blue Smart IP67 Charger is the wireless solution to monitor voltage and current, to change settings and to update the charger when new features become available.
With Bluetooth, the functionality of the IP67 charger is enhanced and is similar to that of our IP22 and IP65 chargers.

Completely encapsulated: waterproof, shockproof and ignition protected
Water, oil or dirt will not damage the Blue Smart IP67 Charger. The casing is made of cast aluminium and the electronics are moulded in resin.

The highest efficiency ever!
Setting a new industry standard: with 92 % efficiency or better, these chargers waste three to four times less heat. And once the battery is fully charged, power consumption reduces to less than a Watt, some five to ten times better than the industry standard.

Adaptive 5-stage charge algorithm: bulk – absorption – recondition – float – storage
The Blue Smart Charger features a microprocessor controlled 'adaptive' battery management. The 'adaptive' feature will automatically optimise the charging process relative to the way the battery is being used.

Storage Mode: Less maintenance and aging when the battery is not in use
The storage mode kicks in whenever the battery has not been subjected to discharge during 24 hours. In the storage mode float voltage is reduced to 2,2 V/cell (13,2 V for a 12 V battery) to minimise gassing and corrosion of the positive plates. Once a week the voltage is raised back to the absorption level to 'equalize' the battery. This feature prevents stratification of the electrolyte and sulphation, a major cause of early battery failure.

Also charges Li-ion batteries
Li-ion batteries are charged with a simple bulk – absorption – float algorithm.

Fully discharged battery recovery function
Will initiate charging even if the battery has been discharged to zero volts.
Will reconnect to a fully discharged Li-ion battery with internal disconnect function.

Protected against overheating
Can be used in a hot environment such as a machine room. Output current will reduce as temperature increases up to 60 °C, but the charger will not fail.

Two LEDs for status indication
Yellow LED: bulk charge (blinking fast), absorption (blinking slow), float (solid), storage (off)
Green LED: power on

Blue Smart IP67 Charger	12/7	12/13	12/17	12/25	24/5	24/8	24/12
Nominal voltage range and frequency	220-240 VAC 50-60 Hz						
Input voltage range and frequency	180-265 VAC 45-65 Hz						
Efficiency	93 %	93 %	95 %	95 %	94 %	96 %	96 %
No load power consumption	0.5 W						
Charge voltage 'absorption'	Normal: 14,4 V High: 14,7 V Li-ion: 14,2 V				Normal: 28,8 V High: 29,4 V Li-ion: 28,4 V		
Charge voltage 'float'	Normal: 13,8 V High: 13,8 V Li-ion: 13,5 V				Normal: 27,6 V High: 27,6 V Li-ion: 27,0 V		
Charge voltage 'storage'	Normal: 13,2 V High: 13,2 V Li-ion: 13,5 V				Normal: 26,4 V High: 26,4 V Li-ion: 27,0 V		
Charge current, normal mode	7 A	13 A	17 A	25 A	5 A	8 A	12 A
Charge current, LOW	2 A	4 A	6 A	10 A	2 A	3 A	4 A
Charge algorithm	5-stage adaptive						
Can be used as power supply	yes						
Protection	Battery reverse polarity (fuse) Output short circuit Over temperature						
Operating temp. range	-20 °C to +60 °C (full rated output up to 40 °C) Derate 3 % per °C above 40 °C						
Humidity	Up to 100 %						
Start interrupt option (12/25(1+si) and 24/12(1+si) models only)	Short circuit proof, current limit 0,5 A Output voltage: max one volt lower than main output						
ENCLOSURE							
Material & Colour	aluminium (blue RAL 5012)						
Battery-connection	Black and red cable of 1,5 meter						
230 VAC-connection	Cable of 1,5 meter with CEE 7/7 plug						
Protection category	IP67						
Weight (kg)	1,8	1,8	2,4	2,4	1,8	2,4	2,4
Dimensions (h x w x d in mm)	85 x 211 x 60	85 x 211 x 60	99 x 219 x 65	99 x 219 x 65	85 x 211 x 60	99 x 219 x 65	99 x 219 x 65
STANDARDS							
Safety	EN 60335-1, EN 60335-2-29						
Emission Immunity	EN 55014-1, EN 61000-6-3, EN 61000-3-2						
Automotive Directive	EN 55014-2, EN 61000-6-1, EN 61000-6-2, EN 61000-3-3						

Blue Smart Charger
IP65

Professional Smart Battery Charger

- Waterproof 12V battery charger with a configurable current of 2 or 7A
- Check the charging status with the VictronConnect app and configure all settings
- Seven-step smart charge algorithm & battery life enhancing features
- Recovery of fully discharged 'dead' batteries
- Automatic power supply function
- Severe cold performance down to -40°C

5 YEAR Warranty

Waterproof 12V battery charger with a configurable current

Charging status indicator

Seven step smart charge algorithm & battery life enhancing features

Can recover fully discharged 'dead' batteries

VictronConnect app

Select pre-set charging algorithms for different battery types and check the charging status

Takes best of care of Li-ion, WET, MF, GEL, AGMand Ca/Ca batteries

- Short circuit, overheat and reverse polarity protection
- Automatic storage mode: no need to disconnect when battery is fully charged.
- Automatic power supply function

Blue Smart IP65 Charger	6 V/12 V - 1.1 A	12 V4/5/7/10/15/25 A	24 V 5/8/13 A
Input voltage and frequency range	100 - 250VAC | 45 - 65Hz	230 VAC	
Efficiency	82%	94%	95%
Standby power consumption	<0,5 W	0,5 W	
Minimum battery voltage	Starts charging from down to 0 V		
Charge voltage 'absorption'	Normal: 7,2 V | 14,4 V High: 7,35 V | 14,7 V Li-ion: 7,1 V | 14,2 V	Normal: 14,4 V High: 14,7 V Li-ion: 14,2 V	Normal: 28,8 V High: 29,4 V Li-ion: 28,4 V
Charge voltage 'float'	Normal: 6,9 V | 13,8 V High: 6,9 V | 13,8 V Li-ion: Disabled	Normal: 13,8 V High: 13,8 V Li-ion: 13,5 V	Normal: 27,6 V High: 27,6 V Li-ion: 27,0 V
Charge voltage 'storage'	Normal: 6,6 V | 13,2 V High: 6,6 V | 13,2 V Li-ion: 6,75 V | 13,5 V	Normal: 13,2 V High: 13,2 V Li-ion: 13,5 V	Normal: 26,4 V High: 26,4 V Li-ion: 27,0 V
Charge current	1.1 A	4 / 5 / 7 / 10 / 15 / 25 A	5 / 8 / 13 A
Low current mode	0,5A	2 / 2 / 2 / 3 / 4 / 10 A	2 / 3 / 4 A
Temperature compensation (lead-acid batteries only)	8 mV/°C | 16 mV/°C	16 mV/°C	32 mV/°C
Power supply mode	Yes		
Back current drain	0,1 Ah/month (140uA)	0,7 Ah/month (1 mA)	
Protection	Reverse polarity, Output short circuit, Over temperature		
Operating temp. range	-30 to +50°C (full rated output up to 30°C)	-40 to +60°C (full rated output up to 30°C) (cables retain flexibility at low temperature)	
Humidity (non-condensing)	Max 95%		
Charge algorithm	7-stage adaptive		
Bluetooth	-4dBm, 2402 - 2480 MHz		

ENCLOSURE		
Battery-connection	Black and red cable of 1,5 meter	
230V AC-connection	1.5m cable with CEE 7/16 or AS/NZS 3112 plug or	Cable of 1,5 meter with CE 7/16, CE 7/17, BS 1363 plug (UK) AS/NZS 3112 plug
Protection category	IP65 (splash and dust proof)	
Weight	0,4 kg	IP65 12 V 25 A 24 V 13 A: 1,9 kg Other: 0,9 kg IP65s 12 V 4/5 A : 45 x 81 x 182 mm IP65 12 V 7 A 24 V 5 A: 47 x 95 x 190 mm
Dimensions (h x w x d)	38 x 64 x 153 mm	IP65 12 V 10/15 A 24 V 8 A: 60 x 105 x 190 mm IP65 12 V 25 A 24 V 13 A: 75 x 140 x 240 mm

STANDARDS	
Safety	EN 60335-1, EN 60335-2-29
Emission	EN 55014-1, EN 61000-6-3, EN 61000-3-2
Immunity	EN 55014-2,EN 61000-6-1, EN 61000-6-2, EN 61000-3-3

INCLUDED

Connect clamps

Eyelet connector

OPTIONAL ACCESSORIES

Car plug

Extension cable

Eyelet connector (M8) with fuse

Connect clamps with fuse

SMART IP43 CHARGER 120-240V

Smart IP43 Charger 12/50(1+1)

Bluetooth sensing:
Smart Battery Sense

Bluetooth sensing:
BMV-712 Smart Battery Monitor

Smart IP43 Charger 12/50(3)

Bluetooth Smart built-in
The wireless solution to set-up, monitor, control, update and synchronise Smart IP43 Chargers.

Smart IP43 Charger (1+1): two outputs to charge 2 battery banks
The second output, limited to approximately 4 A and with a slightly lower output voltage, is intended to top up a starter battery.

Smart IP43 Charger (3): three full current outputs to charge 3 battery banks
Each output can supply the full rated output current. But the total of the 3 outputs combined can never exceed the current rating of the charger.

Automatic voltage compensation
The charger compensates for voltage drop over the DC cabling by slightly increasing output voltage when the DC current increases. Please see the manual for details.

Adaptive 6-stage charge algorithm: bulk– absorption – recondition – float – storage – refresh
The Smart IP43 Charger features our well-known "adaptive" battery management system that can be preset to suit different types of batteries. The 'adaptive' feature will automatically optimise the charge process relative to the way the battery is being used.

The right amount of charge: variable absorption time
When only shallow discharges occur (a yacht connected to shore power for example) the absorption time is kept short in order to prevent overcharging of the battery. After a deep discharge the absorption time is automatically increased to make sure that the battery will be fully charged.

Preventing damage due to excessive gassing: the BatterySafe mode (see fig. 2)
If, in order to quickly charge a battery, a high charge current in combination with a high absorption voltage has been chosen, the charger will prevent damage due to excessive gassing by automatically limiting the rate of voltage increase once the gassing voltage has been reached (see the charge curve between 14,4 V and 15,0 V in fig. 2).

Less maintenance and aging when the battery is not in use: the Storage Mode (see fig. 1 & 2)
The Storage Mode kicks in whenever the battery has not been subjected to discharge during 24 hours. In the Storage Mode float voltage is reduced to 2,2 V/cell (13,2 V for a 12 V battery) to minimize gassing and corrosion of the positive plates. Once a week the voltage is raised back to the absorption level to 'equalize' the battery. This feature prevents stratification of the electrolyte and sulphation, a major cause of early battery failure.

Also charges Li-ion ($LiFePO_4$) batteries
Charger on-off control can be implemented by connecting a relay or open collector optocoupler output from a Li-ion BMS to the remote on-off port.
Alternatively full control of voltage and current can be achieved with Bluetooth.

Fully programmable charge algorithm
The charge algorithm can be programmed with help of Bluetooth or the VE.Direct interface.
Three preprogrammed algorithms can be selected with the mode button (see specifications).

Optional external battery voltage and temperature sensing via Bluetooth
A Smart Battery Sense, SmartShunt or a BMV-712 Smart Battery Monitor can be used to communicate battery voltage and temperature to one or more Smart IP43 Chargers via VE.Smart Networking.

Remote on-off
The remote on/off consists of two terminals: Remote H and Remote L.
A remote on/off switch or relay contact can be connected between H and L.
Alternatively, terminal H can be pulled high, or terminal L can be pulled low.
See manual for details.

VE.Direct interface
For a wired data connection to a GX device such as the Cerbo GX, PC or other devices. Also enables Instant Readout functionality via VictronConnect remotely from VRM.
Please see the VictronConnect app.

Programmable relay
Can be programmed using the VE.Direct interface or a Bluetooth enabled device to trip on an alarm or other events.

Synchronised charging
Pairing two or more Smart IP43 Chargers in a VE.Smart Network, enables synchronised charging.
This improves the charge efficiency and battery life.

Learn more about batteries and battery charging
For more information about adaptive charging please look under Downloads / Technical information on our website.

Smart IP43 Charger	12/30 (1+1) & (3)	12/50 (1+1) & (3)	24/16 (1+1) & (3)	24/25 (1+1) & (3)
Input voltage	85 – 250 VAC (full power from 100 VAC, startup from 90 VAC)			
DC input voltage range	90 – 375 VDC			
Frequency	45-65 Hz			
Power factor	1			
Back current drain	<1 mA			
No load power consumption	1 W			
Maximum Efficiency	95 %	94 %	96 %	96 %
Charge voltage - Absorption / Float / Storage	Normal: 14.4 V / 13.8 V / 13.2 V High: 14.7 V / 13.8 V / 13.2 V Li-ion: 14.2 V / N/A / 13.5 V		Normal: 28.8 V / 27.6 V / 26.4 V High: 29.4 V / 27.6 V / 26.4 V Li-ion: 28.4 V / N/A / 27.0 V	
Fully programmable	Yes, with Bluetooth and/or VE.Direct			
Maximum input current setting	3 – 10 A			
Number of battery connections	(1+1) models: 2 (2nd output via 2 pole terminal & 4 A max) | (3) models: 3			
Charge current house battery	30 A	50 A	16 A	25 A
Low current mode	15 A	25 A	8 A	12,5 A
Temperature compensation - Default	-16 mV/°C		-32 mV/°C	
Charge current starter battery	4 A Max (1+1 output models only)			
Charge algorithm	6-stage adaptive (3 stage for Li-ion)			
Protection	Battery reverse polarity (fuse, not user accessible) / Output short circuit / Over temperature			
Can be used as power supply	Yes, output voltage can be set with Bluetooth and/or VE.Direct			
Operating temp. range	-20 to 60 °C (0 – 140 °F) Rated output current up to 40 °C, derate linearly to 20 % at 60 °C			
Humidity (non-condensing)	max 95 %			
Remote on/off	Yes (2 pole terminal)			
Relay (programmable)	Yes (SPDT - 5 A up to 250 VAC / 5 A up to 28 VDC)			
Bluetooth	Power: -4 dBm | Frequency: 2402 – 2480 MHz			
ENCLOSURE				
Material & Color	aluminium (blue RAL 5012)			
Battery connection	Screw terminals 16 mm² (AWG6)			
AC-connection	IEC 320 C14 inlet with retainer clip (AC cord ordered separately)			
Protection category	Electronic components: IP43 | Connection area: IP22			
Weight kg (lbs)	2,7 kg (6 lbs)			
Dimensions (h x w x d)	180 x 249 x 116 mm (7.1 x 9.8 x 4.6 inch)			
STANDARDS				
Safety	EN 60335-1, EN 60335-2-29			
Emission	EN 55014-1, EN 61000-6-3, EN 61000-3-2			
Immunity	EN 55014-2, EN 61000-6-1, EN 61000-6-2, EN 61000-3-3			
Vibration	IEC68-2-6:10-150Hz/1.0G			

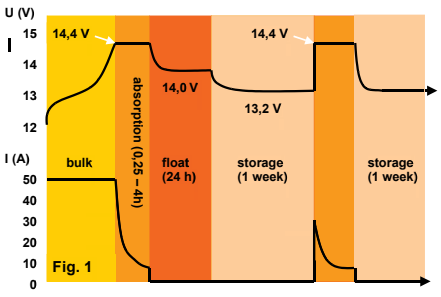
Retainer clip
(included)

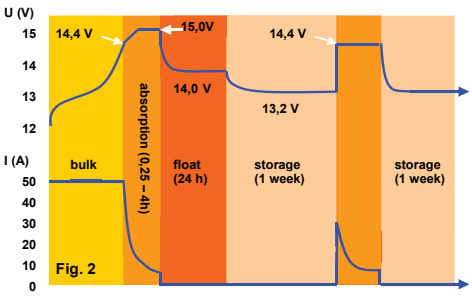
Mains Cord CEE 7/7
(must be ordered separately)

Mains Cord NEMA 5-15P plug
(must be ordered separately)

Plug options:
Europe: CEE 7/7
UK: BS 1363
Australia/New Zealand: AS/NZS 3112
US: NEMA 5-15P

Charge curves: up to the gassing voltage (fig.1), and exceeding the gassing voltage (fig.2)

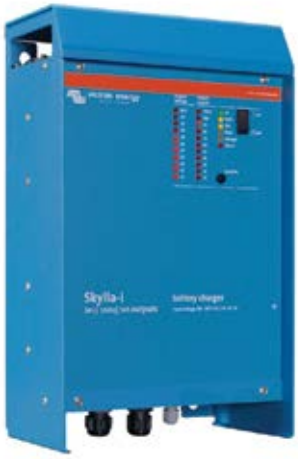




SKYLLA-I BATTERY CHARGER 24V

Lithium Ion battery compatible

Skylla-i 24/100 (3)



Skylla-i 24/100 (1+1)

Skylla-i (1+1): two outputs to charge 2 battery banks
The Skylla-i (1+1) features 2 isolated outputs. The second output, limited to approximately 4A and with a slightly lower output voltage, is intended to top up a starter battery.

Skylla-i (3): three full current outputs to charge 3 battery banks
The Skylla-i (3) features 3 isolated outputs. All outputs can supply the full rated output current.

Rugged
Aluminium epoxy powder coated cases with drip shield and stainless steel fixings withstand the rigors of an adverse environment: heat, humidity and salt air.
Circuit boards are protected with an acrylic coating for maximum corrosion resistance.
Temperature sensors ensure that power components will always operate within specified limits, if needed by automatic reduction of output current under extreme environmental conditions.

Flexible
Next to a CAN bus (NMEA2000) interface, a rotary switch, DIP switches and potentiometers are available to adapt the charge algorithm to a particular battery and its conditions of use.
Please refer to the manual for a complete overview of the possibilities.

Important features:

Synchronised parallel operation
Several chargers can be synchronised with the CAN bus interface. This is achieved by simply interconnecting the chargers with RJ45 UTP-cables. Note: Two output and three output chargers cannot be paralleled with each other. Please see the manual for details.

The right amount of charge for a lead-acid battery: variable absorption time
When only shallow discharges occur the absorption time is kept short in order to prevent overcharging of the battery. After a deep discharge the absorption time is automatically increased to make sure that the battery is completely recharged.

Preventing damage due to excessive gassing: the BatterySafe mode
If, in order to quickly charge a battery, a high charge current in combination with a high absorption voltage has been chosen, the Skylla-i will prevent damage due to excessive gassing by automatically limiting the rate of voltage increase once the gassing voltage has been reached.

Less maintenance and aging when the battery is not in use: the Storage mode
The storage mode kicks in whenever the battery has not been subjected to discharge during 24 hours. In the storage mode float voltage is reduced to 2,2V/cell (26,4V for 24V battery) to minimise gassing and corrosion of the positive plates. Once a week the voltage is raised back to the absorption level to 'refresh' the battery. This feature prevents stratification of the electrolyte and sulphation, a major cause of early battery failure.

To increase battery life: temperature compensation
Every Skylla-i comes with a battery temperature sensor. When connected, charge voltage will automatically decrease with increasing battery temperature. This feature is especially recommended for sealed lead-acid batteries and/or when important fluctuations of battery temperature are expected.

Battery voltage sense
In order to compensate for voltage loss due to cable resistance, the Skylla-i is provided with a voltage sense facility so that the battery always receives the correct charge voltage.

Suitable for AC and DC supply (AC-DC and DC-DC operation)
The chargers also accept a DC supply.

Use as a power supply
As a result of the perfectly stabilized output voltage, the Skylla-i can be used as a power supply if batteries or large buffer capacitors are not available.

Li-Ion (LiFePO4) ready
Simple charger on-off control can be implemented by connecting a relay or open collector optocoupler output from a Li-Ion BMS to the remote control port of the charger. Alternatively complete control of voltage and current can be achieved by connecting to the galvanically isolated CAN bus port.

Learn more about batteries and battery charging
To learn more about batteries and charging batteries, please refer to our book 'Energy Unlimited' (available free of charge from Victron Energy and downloadable from www.victronenergy.com).

Skylla-i	24/80 (1+1)	24/80 (3)	24/100 (1+1)	24/100 (3)
Input voltage (VAC)	230V			
Input voltage range (VAC)	185-265V			
Input voltage range (VDC)	180-350V			
Maximum AC input current @ 180 VAC	16A		20A	
Frequency (Hz)	45-65Hz			
Power factor	0,98			
Charge voltage 'absorption' (VDC) (1)	28,8V			
Charge voltage 'float' (VDC)	27,6V			
Charge voltage 'storage' (VDC)	26,4V			
Charge current (A) (2)	80A	3 x 80A (max total output: 80A)	100A	3 x 100A (max total output: 100A)
Charge current starter batt. (A)	4A	n. a.	4	n. a.
Charge algorithm	7 stage adaptive			
Battery capacity (Ah)	400-800Ah		500-1000Ah	
Charge algorithm, Li-Ion	3 stage, with on-off control or CAN bus control			
Temperature sensor	Yes			
Can be used as power supply	Yes			
Remote on-off port	Yes (can be connected to a Li-Ion BMS)			
VE.Can communication port	Two RJ45 connectors, NMEA2000 protocol, galvanically isolated. Integrated 12V CAN-bus power supply, 30V DC maximum (3)			
Synchronised parallel operation	Yes, with VE.Can			
Alarm relay	DPST AC rating: 240VAC/4A DC rating: 4A up to 35VDC, 1A up to 60VDC			
Forced cooling	Yes			
Protection	Battery reverse polarity (fuse) Output short circuit Over temperature			
Operating temp. range	-20 to 60°C (Full output current up to 40°C)			
Humidity (non-condensing)	max 95%			
ENCLOSURE				
Material & Colour	aluminium (blue RAL 5012)			
Battery-connection	M8 bolts			
230 VAC-connection	screw-clamp 10mm² (AWG 7)			
Protection category	IP 21			
Weight kg (lbs)	7kg (16 lbs)			
Dimensions hxwxd in mm (hxwxd in inches)	405 x 250 x 150 (16.0 x 9.9 x 5.9)			
STANDARDS				
Safety	EN 60335-1, EN 60335-2-29			
Emission	EN 55014-1, EN 61000-6-3, EN 61000-3-2			
Immunity	EN 55014-2, EN 61000-6-1, EN 61000-6-2, EN 61000-3-3			

1) Output voltage range 20-36V. Can be set with rotary switch or potentiometers.

2) Up to 40°C (100°F) ambient. Output will reduce to 80% at 50°C, and to 60% at 60°C.

3) When connecting the Skylla-i in a VE.Can network that also contains devices connected to a 48V battery bank, make sure to use a special RJ-45 cable, which has pins 2 and 6 (NET-S / V+) not connected.

BMV-700 Battery Monitor

The BMV-700 Battery Monitor features an advanced microprocessor control system combined with high resolution measuring systems for battery voltage and charge/discharge current.
The software includes complex calculation algorithms, like Peukert's formula, to exactly determine the state of charge of the battery.
The BMV-700 selectively displays battery voltage, battery current, consumed Ah or time to go.

Skylla-i Control

The Skylla-i Control panel provides remote control and monitoring of the charge process with LED status indication. In addition, the remote panel also offers input current adjustment that can be used to limit the input current and thus the power drawn from the AC supply. This is particularly useful when operating the charger from limited shore power or small gensets. The panel can also be used to change several battery charging parameters.
Several control panels can be connected to one charger or to a set of synchronised and parallel connected chargers.

SKYLLA TG CHARGER 24/48V 230V

Skylla TG 24 50

Skylla TG 24 50 3-phase

Skylla TG 24 100

Perfect chargers for any type of battery
Charge voltage can be precisely adjusted to suit any sealed or unsealed battery system.
In particular, sealed maintenance free batteries must be charged correctly in order to ensure a long service life.
Overvoltage will result in excessive gassing and venting of a sealed battery. The battery will dry out and fail.

Suitable for AC and DC supply (AC-DC and DC-DC operation)
Except for the 3-phase input models, the chargers also accept a DC supply.

Controlled charging
Every TG Charger has a microprocessor, which accurately controls the charging in three steps. The charging process takes place in accordance with the IUoUo characteristic and charges more rapidly than other processes.

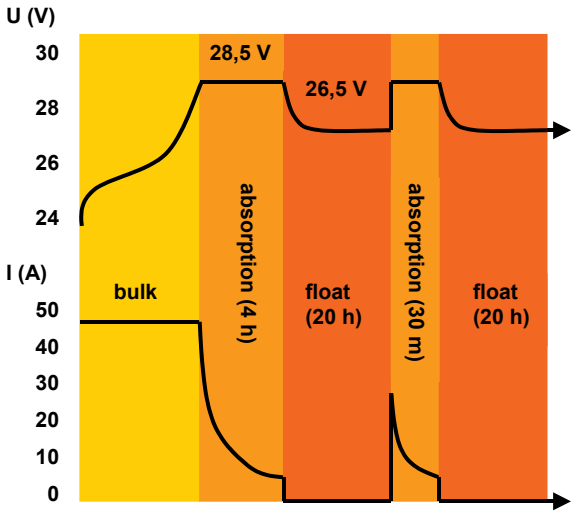
Use of TG Chargers as a power supply
As a result of the perfectly stabilized output voltage, a TG Charger can be used as a power supply if batteries or large buffer capacitors are not available.

Two outputs to charge 2 battery banks (24V models only)
The TG Chargers feature 2 isolated outputs. The second output, limited to approximately 4A and with a slightly lower output voltage, is intended to top up a starter battery.

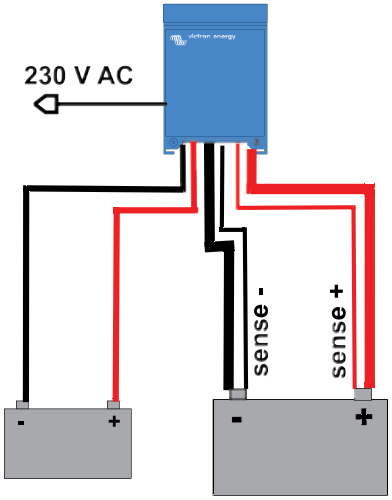
To increase battery life: temperature compensation
Every Skylla TG Charger comes with a battery temperature sensor. When connected, charge voltage will automatically decrease with increasing battery temperature. This feature is especially recommended for sealed batteries which otherwise might be overcharged and dry out due to venting.

Battery voltage sense
In order to compensate for voltage loss due to cable resistance, TG Chargers are provided with a voltage sense facility so that the battery always receives the correct charge voltage.

Learn more about batteries and battery charging
To learn more about batteries and charging batteries, please refer to our book 'Energy Unlimited' (available free of charge from Victron Energy and downloadable from www.victronenergy.com).



Charge curve



Application example

Skylla TG	24/30 TG	24/50 TG	24/50 TG 3 faz	24/80 TG	24/100 TG	24/100 TG 3 faz	48/25 TG	48/50 TG
Giriş voltajı (V AC)	120/230	230	3 x 400	230	230	3 x 400	230	230
Giriş voltajı aralığı (V AC)	95-264	185-264	320-450	185-264	185-264	320-450	185-264	185-264
Giriş voltajı aralığı (V CD)	120-400	180-400	n. a.	180-400	180-400	n. a.	180-400	180-400
Frekans (Hz)	45-65							
Güç faktörü	1							
Şarj voltajı "emilim" (V DC)	28,5		28,5	28,5	28,5	28,5	57	57
Şarj voltajı "değişken" (V DC)	26,5		26,5	26,5	26,5	26,5	53	53
Şarj akımı ev aküsü (A) (2)	30	50	50	80	100	100	25	50
Şarj akımı ev aküsü. 110 VAC'de (A) (3)	30	30	n. a.	60	60	n. a.	15	30
Şarj akımı marş aküsü (A)	4		4	4	4	4	n. a.	n. a.
Şarj özelliği	IUoUo (üç adım)							
Akü kapasitesi (Ah)	150-500		250-500	400-800	500-1000	500-1000	125-250	250-500
Sıcaklık sensörü	√							
Güç kaynağı olarak kullanılabilir	√							
Uzaktan kumandalı alarm	Potansiyelsiz kontaklar 60 V / 1 A (1x NO ve 1x NC)							
Zorla soğutma	√							
Koruma (1)	a,b,c,d							
Çalışma sıcaklığı aralığı	-40 ila +50 °C (-40 – 122 °F)							
Nem (yoğuşmasız)	maks. %95							
MUHAFAZA								
Malzeme ve Renk	alüminyum (mavi RAL 5012)							
Akü bağlantısı	M8 çiviler							
230 V AC bağlantısı	Vidalı kelepçe 2,5 mm² (AWG 6)							
Koruma kategorisi	IP 21							
Ağırlık-kg (lbs)	5,5 (12.1)		13 (28)	10 (22)	10 (22)	23 (48)	5,5 (12.1)	10 (22)
Boyutlar yxgxd in mm (inç cinsinden yxgxd)	365 x 250 x 147 (14.4 x 9.9 x 5.8)		365 x 250 x 257 (14.4 x 9.9 x 10.1)			515 x 260 x 265 (20 x 10.2 x 10.4)	365 x 250 x 147 (14.4 x 9.9 x 5.8)	365 x 250 x 257 (14.4 x 9.9 x 10.1)
STANDARTLAR								
Güvenlik	EN 60335-1, EN 60335-2-29							
Emisyon	EN 55014-1, EN 61000-3-2							
Bağışıklık	EN 55014-2, EN 61000-3-3							

1) Koruma
a. Çıkış kısa devresi
b. Akü ters polarite algılaması
c. Akü voltajı çok yüksek
d. Sıcaklık çok yüksek
2) 40°C'ye kadar (100°F) ortam sıcaklığı ve belirtilen giriş voltajı aralığında
3) 40°C'ye kadar (100°F) ortam sıcaklığı ve 110 VAC giriş voltajında

BMV-700 Akü Monitörü

BMV-700 Akü Monitörü, akü voltajı ve şarj/deşarj akımına yönelik yüksek çözünürlüklü bir ölçüm sistemiyle donatılan gelişmiş bir mikroişlemci kontrol sistemine sahiptir. Bunun yanı sıra, yazılım, akünün şarj durumunun tam olarak belirlenebilmesi için Peukert formülü gibi karmaşık hesaplama algoritmaları yer alır. BMV-700 akü voltajını, akımını, tüketilen Ah veya kalan süreyi seçime bağlı olarak gösterir.

Skylla Control

Skylla Control, şarj akımını değiştirmenizi ve sistem durumunu görmenizi sağlar. Kıyı güç sigortası sınırlıysa şarj akımının değiştirilmesi faydalı olacaktır: Akü şarj cihazı tarafından çekilen AC akımı, maksimum çıkış akımı sınırlandırılarak kontrol edilebilir ve böylece kıyı güç sigortasının patlaması önlenebilir.

Şarj Cihazı Anahtarı

Uzaktan açma-kapama anahtarı

Akü Alarmı

Aşırı yüksek veya düşük akü voltajı durumunda, sesli ve görsel alarmla uyarı verilir.

ORION-TR SMART DC-DC CHARGER NON-ISOLATED: 360 / 400 WATT

Orion-Tr Smart non-isolated 12/12-30

Orion-Tr Smart non-isolated 12/12-30

The Orion-Tr Smart non-isolated DC-DC charger serves as a DC-DC battery charger or as a power supply (it is also designed for use as a constant voltage source), offering a wide input and output voltage range. This is especially significant in the case of vehicles with a Euro 5 or Euro 6 smart alternator, which often supplies too low charging voltage even when the engine is running or when extended cable lengths, as is often the case in boats and RVs, lead to voltage drops. In such scenarios, precise and controlled charging is imperative to fully charge the service battery while protecting the starter/input battery from discharge.

Bluetooth Smart enabled

- Any Bluetooth enabled smart phone, tablet or other device can be used to monitor, to change settings and to update the charger when new software features become available.
- Instant Readout: The VictronConnect App can display key data, including warnings and alarms, on the Device list page without the need to connect to the product.

Fully programmable

- Battery charge algorithm (configurable) or fixed output.
- Smart alternator compatibility: engine running detection mechanism.

Adaptive 3-stage charge algorithm: bulk – absorption – float

- For lead acid batteries it is important that during shallow discharges the absorption time is kept short in order to prevent overcharging of the battery. After a deep discharge the absorption time is automatically increased to make sure that the battery is completely recharged.
- For lithium batteries absorption time is fixed, default 2 hours.
- Alternatively, a fixed output voltage can be chosen.

Remote on/off

A remote on/off switch or relay contact can be connected to a two-pole connector.
Alternatively, the H terminal (right) of the two-pole connector can be switched to battery plus, or the L terminal (left) of the two pole connector can be switched to battery minus (or the chassis of a vehicle, for example).

All models are short-circuit proof and can be paralleled to increase output current

An unlimited number of units can be connected in parallel.

High temperature protected

The output current will reduce at high ambient temperature.

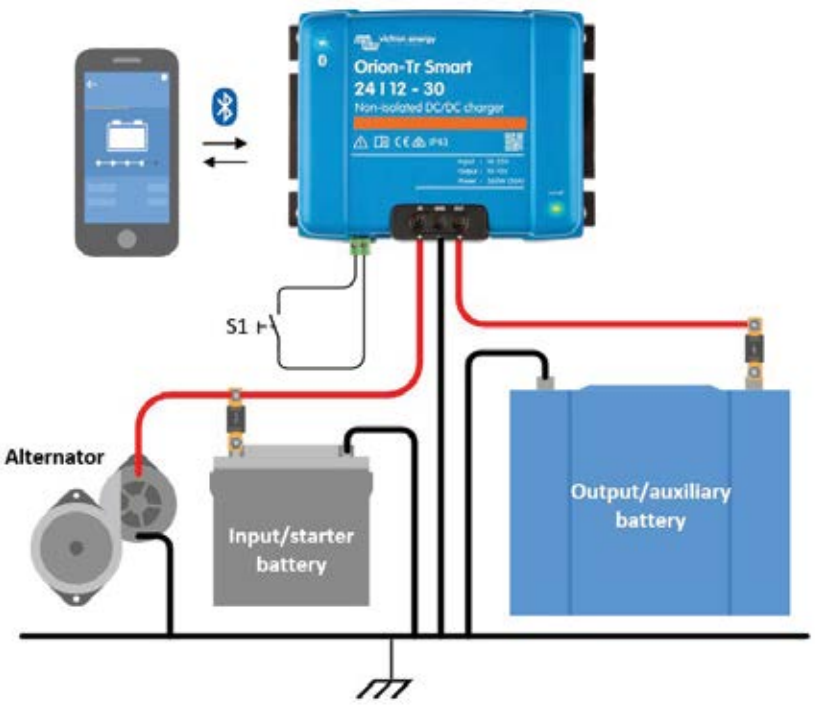
IP43 protection

When installed with the screw terminals oriented downwards.

Screw terminals

No special tools needed for installation.

Input fuse (not replaceable)



Orion-Tr Smart Chargers non-isolated 360 - 400 Watt	12/12-30 (360 W)	12/24-15 (360 W)	24/12-30 (360 W)	24/24-17 (400 W)
Input voltage range [1]	8 - 17 V	8 - 17 V	16 - 35 V	16 - 35 V
Under voltage shut down	7 V	7 V	14 V	14 V
Under voltage restart	7,5 V	7,5 V	15 V	15 V
Nominal output voltage	12,2 V	24,2 V	12,2 V	24,2 V
Output voltage adjust range	10 - 15 V	18 - 30 V	10 - 15 V	18 - 30 V
Output voltage tolerance	+/- 0,2 V			
Output noise	2 mV rms			
Cont. output current at nominal output voltage and 40 °C	30 A	15 A	30 A	17 A
Max. output current (10 s) at nominal output voltage minus 20 %	40 A	25 A	45 A	25 A
Short circuit output current	60 A	40 A	60 A	40 A
Cont. output power at 25 °C	430 W	430 W	430 W	480 W
Cont. output power at 40 °C	360 W	360 W	360 W	400 W
Efficiency	87 %	88 %	88 %	89 %
No load input current	< 80 mA	< 100 mA	< 100 mA	< 80 mA
Standby current	Less than 1 mA			
Can be used as power supply	Yes, output voltage can be set with Bluetooth			
Operating temperature range	-20 to +55 °C (derate 3 % per °C above 40 °C)			
Humidity	Max. 95 % non-condensing			
DC connection	Screw terminals			
Maximum cable cross-section	16 mm² (AWG6)			
Weight	12 V input and/or 12 V output models: 1,8 kg (3 lb) Other models: 1,6 kg (3.5 lb)			
Dimensions hxwxd	130 x 186 x 80 mm (5.1 x 7.3 x 3.2 inch)			
Protection category	IP43 (electronic components), IP22 (connection area)			
Standards: Safety Emission Immunity Automotive Directive	EN 60950 EN 61000-6-3, EN 55014-1 EN 61000-6-2, EN 61000-6-1, EN 55014-2 ECE R10-5			

1) If set to nominal or lower than nominal, the output voltage will remain stable within the specified input voltage range (buck-boost function). If the output voltage is set higher than nominal by a certain percentage, the minimum input voltage at which the output voltage remains stable (does not decrease) increases by the same percentage.

Note 1: The VictronConnect App will not display current in or current out.
Note 2: The Orion-Tr Smart is not equipped with a VE.Direct port.

ORION-TR SMART DC-DC CHARGER
ISOLATED: 250 / 400 WATT

Orion-Tr Smart 12/12-30

Orion-Tr Smart 12/12-30

The Orion-Tr Smart isolated DC-DC charger serves as a DC-DC battery charger or as a power supply (it is also designed for use as a constant voltage source), offering a wide input and output voltage range. This is especially significant in the case of vehicles with a Euro 5 or Euro 6 smart alternator, which often supplies too low charging voltage even when the engine is running or when extended cable lengths, as is often the case in boats and RVs, lead to voltage drops. In such scenarios, precise and controlled charging is imperative to fully charge the service battery while protecting the starter/input battery from discharge.

Bluetooth Smart enabled

- Any Bluetooth enabled smart phone, tablet or other device can be used to monitor, to change settings and to update the charger when new software features become available.
- Instant Readout: The VictronConnect App can display key data, including warnings and alarms, on the Device list page without the need to connect to the product.

Fully programmable

- Battery charge algorithm (configurable) or fixed output.
- Smart alternator compatibility: engine running detection mechanism.

Adaptive 3-stage charge algorithm: bulk – absorption – float

- For lead acid batteries it is important that during shallow discharges the absorption time is kept short in order to prevent overcharging of the battery. After a deep discharge the absorption time is automatically increased to make sure that the battery is completely recharged.
- For lithium batteries absorption time is fixed, default 2 hours.
- Alternatively, a fixed output voltage can be chosen.

Suitable for use in vehicles with a smart alternator (Euro 5 and Euro 6 engines)

The built-in engine shutdown detection will stop the converter when the engine is not running.
This prevents unwanted discharge of the starter battery (see manual for details).

Remote on/off

A remote on/off switch or relay contact can be connected to a two-pole connector.
Alternatively, the H terminal (right) of the two-pole connector can be switched to battery plus, or the L terminal (left) of the two pole connector can be switched to battery minus (or the chassis of a vehicle, for example).

All models are short circuit proof and can be paralleled to increase output current

An unlimited number of units can be connected in parallel.

High temperature protected

The output current will reduce at high ambient temperature.

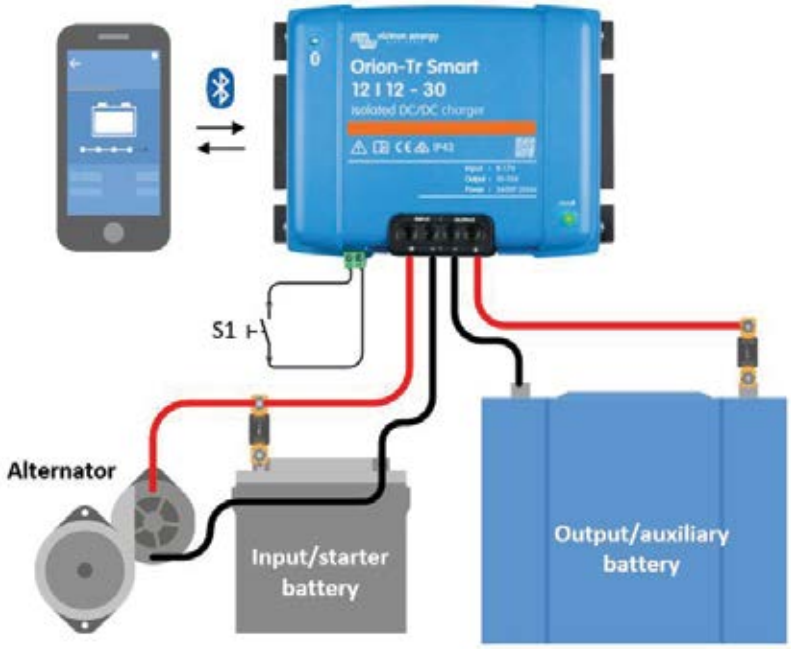
IP43 protection

When installed with the screw terminals oriented downwards.

Screw terminals

No special tools needed for installation.

Input fuse (not replaceable)



Orion-Tr Smart Chargers Isolated 220 - 280 Watt	12/12-18 (220 W)	12/24-10 (240 W)	24/12-20 (240 W)	24/24-12 (280 W)	48/12-20 (240 W)
Input voltage range [1]	8-17 V	8-17 V	16-35 V	16-35 V	32-70V
Under voltage shut down	7 V	7 V	14 V	14 V	28 V
Under voltage restart	7,5 V	7,5 V	15 V	15 V	30 V
Nominal output voltage	12,2 V	24,2 V	12,2 V	24,2 V	12,2 V
Output voltage adjust range	10-15 V	20-30 V	10-15 V	20-30 V	10-15 V
Output voltage tolerance	+/- 0,2 V				
Output noise	2 mV rms				
Cont. output current at nominal output voltage and 40 °C	18 A	10 A	20 A	12 A	20 A
Maximum output current (10 s) at nominal output voltage minus 20 %	25 A	15 A	25 A	15 A	25 A
Short circuit output current	40 A	25 A	50 A	30 A	50 A
Cont. output power at 25 °C	280 W	280 W	300 W	320 W	280 W
Cont. output power at 40 °C	220 W	240 W	240 W	280 W	240 W
Efficiency	87 %	88 %	88 %	89 %	87%
No load input current	< 80 mA	< 100 mA	< 100 mA	< 80 mA	< 80mA
Standby current	Less than 1mA				
Can be used as power supply	Yes, output voltage can be set with Bluetooth				
Galvanic isolation	200 VDC between input, output and case				
Operating temperature range	-20 to +55 °C (derate 3 % per °C above 40 °C)				
Humidity	Max. 95 % non-condensing				
DC connection	Screw terminals				
Maximum cable cross-section	16 mm^2 AWG6				
Weight	1,3 kg (3 lb)				
Dimensions hxwxd	130 x 186 x 70 mm (5.1 x 7.3 x 2.8 inch)				
Protection category	IP43 (electronic components), IP22 (connection area)				
Standards: Safety Emission / Immunity Automotive Directive	EN 60950 EN 61000-6-3, EN 55014-1 / EN 61000-6-2, EN 61000-6-1, EN 55014-2 ECE R10-5				

Orion-Tr Smart Chargers Isolated 360 - 400 Watt	12/12-30 (360 W)	12/24-15 (360 W)	12/48-8 (360 W)	24/12-30 (360 W)	24/24-17 (400 W)	24/48-8,5 (400 W)	48/12-30 (360 W)	48/24-16 (380 W)	48/48-8 (380 W)
Input voltage range [1]	8-17 V	8-17 V	8-17 V	16-35 V	16-35 V	16-35 V	32-70 V	32-70 V	32-70 V
Under voltage shut down	7 V	7 V	7 V	14 V	14 V	14 V	28 V	28 V	28 V
Under voltage restart	7,5 V	7,5 V	7,5 V	15 V	15 V	15 V	30 V	30 V	30 V
Nominal output voltage	12.2 V	24.2 V	48.2 V	12.2 V	24.2 V	48.2 V	12.2 V	24.2 V	48.2 V
Output voltage adjust range	10-15 V	20-30 V	40-60 V	10-15 V	20-30 V	40-60 V	10-15 V	20-30 V	40-60 V
Output voltage tolerance	+/- 0,2 V								
Output noise	2 mV rms								
Cont. output current at nominal output voltage and 40 °C	30 A	15 A	8 A	30 A	17 A	8,5 A	30 A	16 A	8 A
Maximum output current (10 s) at nominal output voltage minus 20 %	40 A	25 A	15 A	45 A	25 A	15 A	40 A	25 A	15 A
Short circuit output current	60 A	40 A	25 A	60 A	40 A	25 A	60 A	40 A	25 A
Cont. output power at 25 °C	430 W	430 W	430 W	430 W	480 W	480 W	430 W	430 W	430 W
Cont. output power at 40 °C	360 W	360 W	360 W	360 W	400 W	400 W	360 W	380 W	380 W
Efficiency	87%	88%	89%	88%	89%	89%	87%	89%	89%
No load input current	< 80mA	< 100mA	< 220mA	< 100mA	< 80mA	< 120mA	< 80mA	< 80mA	< 80mA
Standby current	Less than 1 mA								
Can be used as power supply	Yes, output voltage can be set with Bluetooth								
Galvanic isolation	200 VDC between input, output and case								
Operating temperature range	-20 to +55 °C (derate 3 % per °C above 40 °C)								
Humidity	Max. 95 % non-condensing								
DC connection	Screw terminals								
Maximum cable cross-section	16 mm^2 (AWG6)								
Weight	12 V input and/or 12 V output models: 1,8 kg (4 lb) Other models: 1,6 kg (3.5 lb)								
Dimensions h x w x d	12 V input and/or 12 V output models: 130 x 186 x 80 mm (5.1 x 7.3 x 3.2 inch) Other models: 130 x 186 x 70 mm (5.1 x 7.3 x 2.8 inch)								
Protection category	IP43 (electronic components), IP22 (connection area)								
Standards: Safety Emission / Immunity Automotive Directive	EN 60950 EN 61000-6-3, EN 55014-1 / EN 61000-6-2, EN 61000-6-1, EN 55014-2 ECE R10-5								

1) If set to nominal or lower than nominal, the output voltage will remain stable within the specified input voltage range (buck-boost function). If the output voltage is set higher than nominal by a certain percentage, the minimum input voltage at which the output voltage remains stable (does not decrease) increases by the same percentage.

Note 1) The VictronConnect App will not display current in or current out.

Note 2) The Orion-Tr Smart is not equipped with a VE.Direct port.

ORION-TR DC-DC CONVERTERS, LOW POWER NON-ISOLATED

High efficiency
Using synchronous rectification, full load efficiency exceeds 95%.

IP43 protection
When installed with the screw terminals oriented downwards.

Screw terminals
No special tools needed for installation.

Orion-Tr 24/12-5 (60W)

Orion-Tr 24/12-10 (120W)

Non isolated converters	Orion-Tr 24/12-5	Orion-Tr 24/12-10	Orion-Tr 24/12-15	Orion-Tr 24/12-20
Input voltage range	18-35V	18-35V	18-35V	18-35V
Output voltage	12.7V	12.5V	12.5V	12.5V
Efficiency	95%	97%	97%	97%
Continuous output current	5A	10A	15A	20A
Max. Output current	7A	12A	20A	25A
Galvanic isolation	no	no	no	no
Off load current	< 20mA	< 45mA	< 35mA	< 35mA
Operating temperature range (derate 3% per °C above 40°C)	-20 to +55°C			
DC connection	Screw terminals			
Maximum cable cross-section	3,3 mm^2 AWG12	6 mm^2 AWG10	6 mm^2 AWG10	6 mm^2 AWG10
Weight kg (lbs)	0,09 (0.20)	0,2 (0.44)	0,25 (0.55)	0,25 (0.55)
Dimensions hxwxd in mm (hxwxd in inches)	53x51x27 (2.1x2x1.1)	73x94x37 (2.9x3.7x1.5)	73x94x45 (2.9x3.7x1.8)	73x94x45 (2.9x3.7x1.8)
Standards: Safety Emission Immunity Automotive Directive	EN 60950 EN 61000-6-3, EN 55014-1 EN 61000-6-2, EN 61000-6-1, EN 55014-2 ECE R10-4			

ORION DC-DC CONVERTERS, HIGH POWER NON-ISOLATED

Orion 24/12-25

Orion 24/12-40

Remote on-off connector
The remote on-off eliminates the need for a high current switch in the input wiring. The remote on-off can be operated with a low power switch or by the engine run/stop switch (see manual).

All models with adjustable output can also be used as a battery charger
For example to charge a 12 Volt starter or accessory battery in an otherwise 24V system.

All models with adjustable output can be paralleled to increase output current
Up to five units can be connected in parallel.

Easy to install
Delivery includes four Insulated Fastons Female Crimp 6.3mm (eight Fastons in case of the Orion 24/12-40).

Low power models: please see Orion-Tr series

Orion 24/12-70

Orion 24/12-70 with binding posts

Non isolated converters	Orion 24/12-25	Orion 24/12-40	Orion 24/12-70	Orion 12/24-8	Orion 12/24-10	Orion 12/24-20
Input voltage range (V)	18-35	18-35	18-35	9-18	9-18	9-18
Under voltage shutdown (V)	14	14	14	8	8	8
Under voltage restart (V)	18	18	18	10	10	10
Output voltage adjustable with potentiometer	yes	no	yes	no	yes	yes
Output voltage (V)	Adjustable 10–15V F set 13,2V	13,2	Adjustable 10–15V F set 13,2V	24	Adjustable 20-30V F set 26,4V	Adjustable 20-30V F set 26,4V
Efficiency (%)	96	95	92	95	95	93
Suitable to buffer-charge a battery	yes	no	yes	no	yes	yes
Can be connected in parallel	yes	no	yes	no	yes	yes
Continuous output current (A)	25	40	70	8	10	20
Max. Output current (A)	35	55	85	20	20	30
Fan assisted cooling (temp. controlled)	no	yes	yes	no	no	yes
Galvanic isolation	no	no	no	no	no	no
Off load current	< 15mA	< 20mA	< 20mA	< 10mA	< 15mA	< 30mA
Remote on-off	yes	yes	yes	no	no	yes
Operating temperature range (derate 3% per °C above 40°C)	-20 to +55°C	-20 to +55°C	-20 to +55°C	-20 to +55°C	-20 to +55°C	-20 to +55°C
DC connection	Faston tabs 6.3 mm	Double Faston tabs 6.3 mm	M6 bolts	Faston tabs 6.3 mm	Faston tabs 6.3 mm	M6 bolts
Weight kg (lbs)	0,7 (1.55)	0,85 (1.9)	0,9 (2.0)	0,4 (0.8)	0,4 (0.9)	0,9 (2.0)
Dimensions hxwxd in mm (hxwxd in inches)	65x88x160 (2.6x3.5x6.3)	65x88x185 (2.6x3.5x7.3)	65x88x195 (2.6x3.5x7.7)	45x90x115 (1.8x3.5x4.5)	45x90x125 (1.8x3.5x4,5)	65x88x195 (2.6x3.5x7.7)
Standards: Safety Emission Immunity	EN 60950 EN 61000-6-3, EN 55014-1 EN 61000-6-2, EN 61000-6-1, EN 55014-2					

ORION IP67 24/12 AND 12/24 DC-DC CONVERTERS

Completely encapsulated: waterproof, shockproof and ignition protected
Water, oil or dirt will not damage the Orion IP67 DC-DC Converter. The casing is made of cast aluminium and the electronics are moulded in resin.

Extra-long input and output cables
Thanks to the cables of 1.8 meters in length, intermediate cable interconnections to increase length even more will in most cases not be needed. This is an important reliability increasing feature in an area were IP67 protection grade is needed.

Wide input voltage range
With 15 to 40 Volts input range, a stable output is ensured during surges or sags due to other equipment connected to same battery.

Protected against overheating
It can be used in a hot environment such as a machine room.

Orion IP67	24/12-5	24/12-10	24/12-20	24/12-100	12/24-50
Input voltage range	15-40VDC			18-35VDC	10-15VDC
Under voltage shutdown	13V			15V	8V
Under voltage restart	14V			16V	9V
No load current at 24V	1mA	20mA	50mA	85mA	45mA
DC output voltage	12V +/- 3%	12V +/- 3%	12V +/- 3%	12V +/- 3%	24V +/- 3%
Maximum continuous output current	5A	10A	20A	100A	50A
Efficiency	93%	93%	95%	96%	96%
Ripple & Noise	75mVpp			150mVpp	
Operating temperature range (derate 3% per °C above 40°C)	-40 to +70°C (full rated output up to 40°C)				
Overload protection	Hiccup mode, recovers automatically after fault condition is removed				
Short circuit proof	Yes				
Protection against reverse polarity connection	With external fuse or circuit breaker (not included)				
ENCLOSURE					
Material & Colour	Aluminium (blue RAL 5012)				
Protection category	IP67				
DC connection	Two input and two output cables, length 1,8m			Bolts M6	
Cable cross section, input	0,8mm² (18 AWG)	1,5mm² (15 AWG)	2,6mm² (13 AWG)	n.a.	n.a.
Cable cross section, output	0,8mm² (18 AWG)	1,5mm² (15 AWG)	2,6mm² (13 AWG)	n.a.	n.a.
Weight (kg)	50 g	300 g	300 g	2,15 kg	2,15 kg
Dimensions (h x w x d in mm)	25 x 43 x 20	74 x 74 x 32	74 x 74 x 32	265 x 127 x 63	265 x 127 x 63
STANDARDS					
Safety	EN 60950				
Emission	EN 61000-6-3, EN 55014-1				
Immunity	EN 55014-2, EN 61000-6-1, EN 61000-6-2				
Vibration	IEC 68-2-6: 10-150 Hz / 1.0 G				

Orion IP67 24/12-5
with 1,8 m cables

Orion IP67 24/12-10
Orion IP67 24/12-20

Orion IP67 24/12-100
Orion IP67 12/24-50


LOCKER -
GALLEY -
HEATER -
SPOTS +
LOCKER +
FLKESPACE +
GALLEY +
USB PAX 1 +
DC NON ESSENTIAL LOADS
MPPT +
TO BATTER

ORION XS, DC-DC CONVERTERS

Orion XS 12/12-50A

Orion XS 1400 for 12 & 24V

Engineered from the ground up, the Orion XS redefines adaptive DC-DC battery charging. For use in dual battery systems charged with an (intelligent) alternator. This device not only ensures top-tier performance but also guarantees the safety of your system.
The Orion XS serves as a DC-DC battery charger or as a power supply, offering a wide input and output voltage range. This is especially significant in the case of vehicles with a Euro 5 or Euro 6 smart alternator, which often supplies too low charging voltage even when the engine is running or when extended cable lengths, as is often the case in boats and RVs, lead to voltage drops. In such scenarios, precise and controlled charging is imperative to fully charge the service battery while protecting the starter/input battery from discharge.

Adjustable charging current
The charge current is adjustable with a minimum step size of 0.1 A. via VictronConnect.

Smart alternator compatibility
An integrated mechanism detects whether the engine is running (engine shutdown detection), which only activates the charger when the alternator supplies power. This ensures that the charger only draws power when the alternator is supplying power, i.e. when the engine is running.

Adaptive 4-stage charge algorithm
For lead acid batteries it is important that during shallow discharges the absorption time is kept short in order to prevent overcharging of the battery. After a deep discharge the absorption time is automatically increased to make sure that the battery is completely recharged.
The Orion XS includes fully programmable charging algorithms and eight pre-programmed battery settings.

Low temperature shutdown and input undervoltage protection
To prevent damage of lithium batteries the charger will turn off automatically at low temperatures. It will also shut down when the input voltage drops below a configurable lockout value and restart when the input voltage rises above the restart value, this to protect the input source ie. starter battery from deep discharge.

Remote on/off
The Orion XS can be switched on and off remotely via the remote on/off connector or the VictronConnect App. Typical applications include wiring a switch or Battery Management System (BMS).

Comprehensive electronic protection
The protections includes overload, short circuit and excessive temperatures. The charger is protected against over-temperature by reducing the output power when the maximum product temperature is reached.

Can be paralleled to increase output current
An unlimited number of units can be connected in parallel.

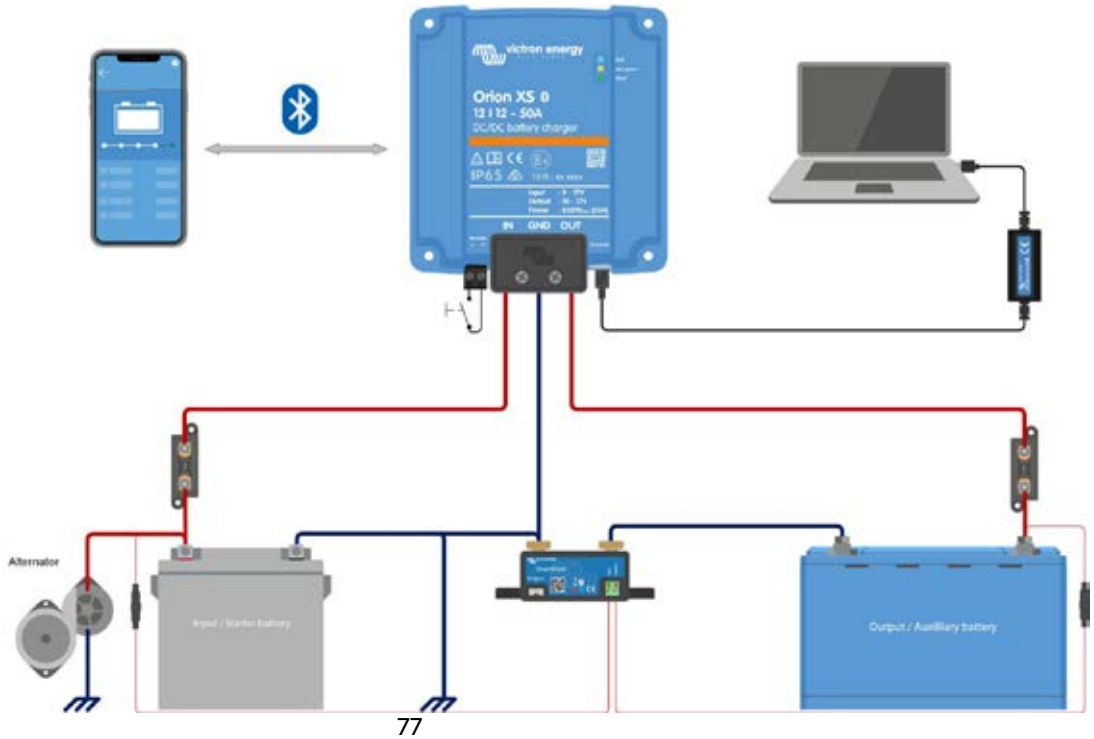
Bluetooth Smart enabled
Built-in Bluetooth Smart: The wireless solution to change settings, monitor activities and update the Orion XS software using Apple and Android smartphones, tablets or other devices. Various parameters can be adjusted with the VictronConnect App.
Instant Readout: The VictronConnect App can display key data, including warnings and alarms, on the Device list page without the need to connect to the product.
VE.Smart Networking: Use VE.Smart Networking to receive Vsense, Tsense and Isense data over the wireless network for your Orion XS DC-DC battery charger, for example, from a BMV, a SmartShunt, or a Smart Battery Sense. The charger uses the available information from the battery to optimise the charging parameters. This improves charging efficiency and extends battery life.

VE.Direct port and DVCC
For a wired connection to a GX device such as the Cerbo GX or Ekrano GX, PC or other devices. Enables advanced monitoring, control and diagnostics from anywhere (requires a GX device connected to the internet and VRM Portal) or locally via the Remote Console, as well as DVCC (Vsense, Tsense, Isense), System wide charge current limit and BMS control.

IP65 protection
The Orion XS complies with ingress protection rating IP65. This means the product is dust-tight and protected against heavy rain.

Orion XS DC-DC battery charger	XS 12/12-50A	XS 1400
Input voltage range	9-17 V	9 – 35 V
Output voltage adjust range	10-17 V	10 – 35 V
Output voltage tolerance	+/- 0.25% (max)	
Output voltage noise	10 mV rms	
Input and output current setting range	1 – 50 A	
Maximum constant short-circuit current	50 A	
Continuous output power up to 40 °C [1]	700 W [4]	1400W [4]
Maximum efficiency	98.5 %	
No-load current consumption	< 100 mA	
Standby current consumption	< 1.5 mA	
Can be used as power supply	Yes, output voltage can be set with VictronConnect App	
Communication		
VictronConnect App / Bluetooth Smart	Yes	
VE.Smart Networking	Yes [2]	
VE.Direct	Yes (including DVCC) [3]	
Other		
Operating temperature range	-20 to +60 °C (derating 1.5 % per °C above 40 °C)	
Humidity	95 %, non-condensing	
Maximum altitude	2000 m	
Pollution degree	PD2	
Overvoltage category	OVC 1	
DC connection	Screw terminals	
Maximum cable cross-section	4AWG (21.2mm²)	
Weight	0.330 kg (0.73 lb)	0.520 kg (1.14 lb)
Dimensions hxwxd	137.3 x 123.1 x 40 mm (5.4 x 4.85 x 1.6 inch)	138.1 x 124.4 x 53mm (5.44 x 4.9 x 2.1 inch)
Protection category	IP65	
Standards		
Safety	IEC 62477-1	IEC 62477-1
EMC	EN 300 328, EN 301 489-1, EN 301 489-17, FCC 15B, ICES-003	EN 300 328, EN 301 489-1, EN 301 489-17, FCC 15B, ICES-003 – all pending
Automotive Directive	ECE R10-6	ECE R10-6 – all pending

1) This applies to optimal cooling where the product is mounted as indicated in the manual with sufficient free space. In case of limited cooling, e.g. due to insufficient airflow, the charging current will be regulated back sooner. With an improved airflow (e.g. forced airflow), derating will take place far above ambient temperatures of 40 °C.
2) VE.Smart Networking features will be receiving Vsense, Tsense and Isense data from the wireless network, for example from a SmartShunt, BMV or Smart Battery Sense. Synchronised charging is not supported.
3) DVCC compatibility requires Orion XS firmware v1.03 or later and Venus OS firmware v3.20 or later on the GX device
4) This value represents the nominal power level at a typical voltage of 14V (12/12-50A) and 28V (Orion XS 1400). Power is calculated as the product of the applied voltage and current (P = V × I). Examples: 12V × 50A = 600W, 14V × 50A = 700W, 28V x 50A = 1400W



EKRANO GX

Ekrano GX front and back

Accessories included with the Ekrano GX

Ekrano GX: communication-centre

The Ekrano GX represents the next generation in the GX product family. With its complete range of connections and interfaces as well as a built-in 7-inch touchscreen display, it is the most powerful GX device to date and allows you to always have perfect control over your system from wherever you are and to maximise its performance. Simply access your system via our Victron Remote Management (VRM) portal, or access it directly, using the built-in touchscreen, a Multi-Functional Display (MFD) or our VictronConnect app thanks to its built-in WiFi Access Point. The Ekrano GX is also the successor to the Color Control GX.

Built-in 7-inch touchscreen display

The seven-inch touchscreen display gives an instant overview of your system and allows you to adjust settings. The touch function can be disabled (or enabled) via a recessed button on the back to prevent unauthorised use. When mounted using the supplied steel bracket, the display is watertight from the outside.

Remote Console on VRM

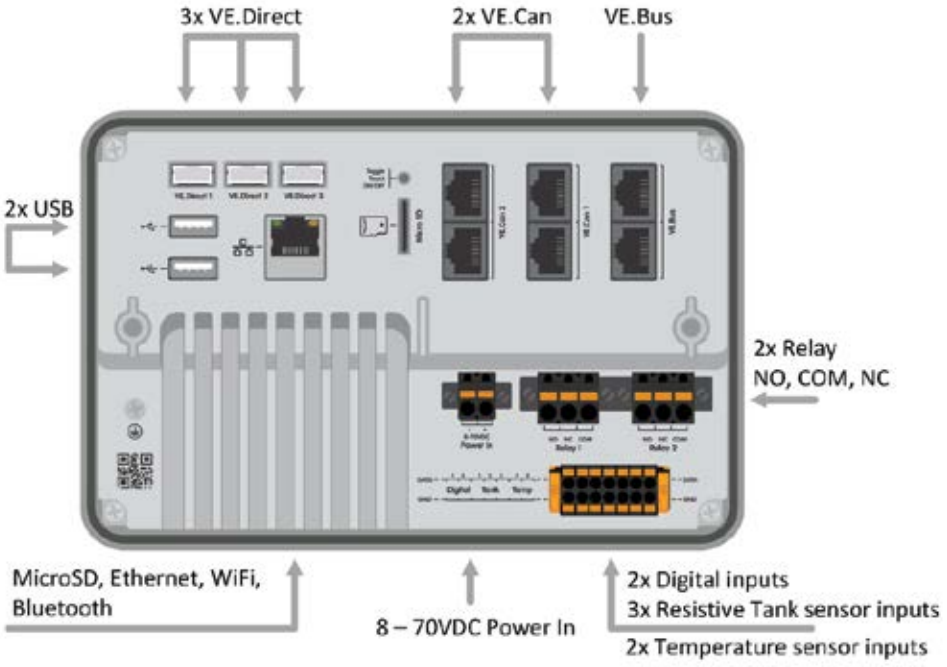
Monitor, control and configure the Ekrano GX remotely, over the internet, just like if you were standing in front of the device, using the Remote Console. The same functionality is also available via local LAN network or via the built-in WiFi access point of the Ekrano GX.

Perfect monitoring & control

Instantly monitor the battery state of charge, power consumption, power harvest from PV, generator, and mains, or check tank levels and temperature measurements. Easily control the shore power input current limit, (auto) start/stop generator(s) or change any setting to optimise the system. Follow up on alerts, perform diagnostic checks and resolve complications remotely.

Simple mounting and configuration

The Ekrano GX installs easily via a cut-out for flush panel mounting and includes both a steel bracket and springs for blind hole mounting. All ports are easily accessible from the back. The power and relay terminal blocks can be screwed in place and the IO terminal block has a quick release clamp for easy access. The Bluetooth feature allows for quick connection and configuration via our VictronConnect app.



Temperature sensor for Quattro, MultiPlus and GX device (e.g. Ekrano GX) as an additional accessory.

Ekrano GX [1]	
Supply voltage	8 – 70 VDC
Power draw display on (100 % brightness)	6.2 W @ 12 V | 6.6 W @ 24 V | 7.4 W @ 48 V
Power draw display off	2.6 W 12 V | 3.0 W @ 24 V | 3.7 W @ 48 V
Relay	2 x NO/NC [2] DC up to 30 VDC: 3 A AC: 1 A, 125 VAC
Communication ports	
VE.Direct ports (always isolated)	3 (max. possible VE.Direct devices: 25) [7]
VE.Bus (always isolated)	1 bus with 2 paralleled RJ45 sockets
VE.Can 1	Yes - isolated
VE.Can 2	Yes – non-isolated
Ethernet	Yes
WiFi	Yes
Bluetooth Smart	Yes [3]
USB Host ports	Yes – 2 x USB-A (max. 1.5 A@5 V combined)
MicroSD Card Slot	Yes – SDHC cards up to max. 32 GB
IO	
Resistive tank level inputs	3 [4]
Temperature sense inputs	2 [5]
Digital Inputs	2 [6]
Display	
Display resolution	1024 x 600 pixels
Display max. backlight brightness	1000 cd/m²
Backlight dimming	Yes – dynamic via built-in ambient light sensor or manually via Remote Console With timer for auto on/off
Touch toggle on/off button	Yes – recessed button on the back (prevents unauthorised use)
Dimensions	
Outer dimensions (h x w x d)	124 x 187 x 29.8 mm | 4.88 x 7.36 x 1.17 in (without connectors and mounting accessories)
Operating temperature range	-20 to +50 °C
Other	
Mounting	Panel integrated flush mount or blind hole mount with included mounting accessories
Buzzer	Yes
Protection category	Front: IP54 (when installed with steel bracket) IP31 (when installed with springs) Back: IP21
Standards	
Safety	IEC 62368-1
EMC	EN 301489-1, EN 301489-17
Automotive	ECE R10-6

Notes

1. For more detailed information about the Ekrano GX, please visit the Victron GX product range page.
2. Currently, Relay 1 can be used for programming as an alarm relay, generator start/stop, tank pump, temperature controlled relay or manual operation. Relay 2 is available for programming as a temperature controlled relay or manual operation in the Relay menu of the GX (requires firmware 2.80 or higher).
3. Bluetooth functionality is intended to be used to assist with initial connection and networking configuration. You cannot use Bluetooth to connect to other Victron products (e.g. SmartSolar charge controllers).
4. The tank level inputs are resistive and should be connected to a resistive tank sender. Victron does not supply tank senders. The tank level ports can each be configured to work with either European (0 - 180 Ohm); or US tank senders (240 - 30 Ohm).
5. The Ekrano GX has 2 temperature inputs. They can be used to measure & monitor all kinds of temperatures. Temperature senders are not included. The required sensor is AS5000001000 - Temperature Sensor QUA/PMP/Venus GX. (Note that this is not the same as the BMV temperature accessory.). Temperature range is -20 °C to +70 °C. Actually, it can measure up to 100 °C, but the sensor is not made to withstand temperatures above 70 °C long term. Note that this is intended as a crude temperature sensor, and not calibrated. A deviation of +/- 2 °C is to be expected.
6. The digital inputs can be used for open/closed monitoring of alarms, for example doors, or fire- or bilge alarms and can also be used for pulse counting. See the product manual for electrical specifications of the digital inputs.
7. The listed maximum in above table is the total connected VE.Direct devices such as MPPT Solar Charge controllers. Total means all directly connected devices plus the devices connected over USB. The limit is mostly bound by CPU processing power. Note that there is also a limit to the other type of devices of which often multiple are connected: PV Inverters. Up to three or four three phase inverters can typically be monitored on a CCGX. Higher power CPU devices can monitor more.

CERBO GX, CERBO-S GX AND GX TOUCH

Cerbo GX

Accessories included with the Cerbo GX

GX Touch (optional display for Cerbo GX and Cerbo-S GX)

GX Touch 50 & 70 protective plastic cover (not for the Flush model)

Cerbo GX: communication-centre

This communication-centre allows you to always have perfect control over your system from wherever you are and to maximise its performance. Simply access your system via our Victron Remote Management (VRM) portal, or access it directly, using the optional GX Touch screen, a Multi-Functional Display (MFD) or our VictronConnect app thanks to its Bluetooth capability.

GX Touch: display accessory

The GX Touch 50 and GX Touch 70 series are display accessories for the Cerbo GX. The five inch and seven inch touch screen displays are available in two versions: top/wall (GX Touch 50 and 70) or flush mount (GX Touch 50 and 70 Flush). They give an instant overview of your system and allows you to adjust settings. Simply connect the display to the Cerbo GX with just one cable. The GX Touch displays have a waterproof design and are simple to install. The supplied (from serial number HQ2242 – not for GX Touch Flush) protection cover prevents damage from UV light during prolonged exposure to the sun.

Remote Console on VRM

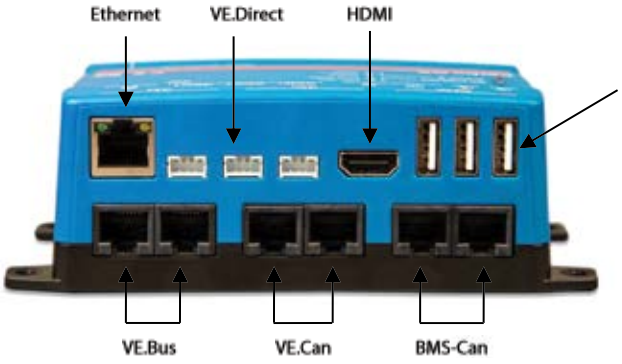
Monitor, control and configure the Cerbo GX remotely, over the internet. Just like if you were standing in front of the device, using Remote Console. The same functionality is also available on the local network LAN, or using the WiFi Access Point of the Cerbo GX.

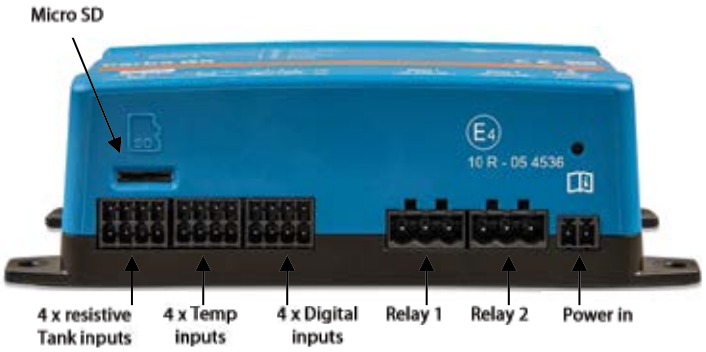
Perfect monitoring & control

Instantly monitor the battery state of charge, power consumption, power harvest from PV, generator, and mains, or check tank levels and temperature measurements. Easily control the shore power input current limit, (auto)start/stop generator(s) or change any setting to optimise the system. Follow up on alerts, perform diagnostic checks and resolve complications remotely.

Simple mounting and configuration

The Cerbo GX is easily mountable and can also be mounted on a DIN-Rail using the DIN35 adapter small, (not included). Its separate touchscreen can be bolted on a dashboard, eliminating the need to create perfect cut-outs (like with the Color Control GX). Connection is easy via just one cable, taking away the hassle of having to bring many wires to the dashboard. The Bluetooth feature enables a quick connection and configuration via our VictronConnect app.





WiFi indicator LED
The Cerbo GX can connect to a WiFi Network

Bluetooth indicator LED
The Cerbo GX can be accessed directly via Bluetooth using the VictronConnect app.

Accessories included
with the GX Touch 50 / 70

Optional accessories for GX
Touch 50 / 70 only

'ouch adapter for CCGX cut-out
adapter is designed to easily replace the
X display with the newer GX Touch 50 or the
ouch 70. Contents of the packaging are the
ıl bracket, the plastic bezel, and four
nting screws.

Accessories included
with the GX Touch 50 / 70 Flush

Temperature sensor for Quattro,
MultiPlus and GX Device (such as the
Cerbo GX)

DIN35 adapter small
DIN-Rail adapter to easily mount a
device on a DIN-Rail. Suitable for the
Cerbo GX.

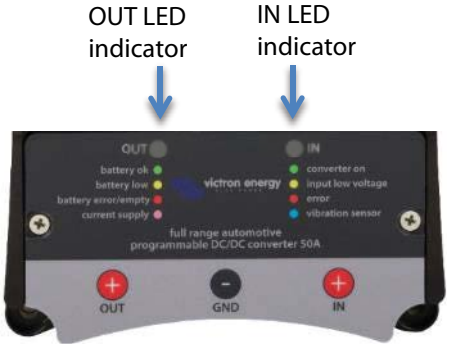
	Cerbo GX (PN BPP900450100)	Cerbo GX BPP900450110 + BPP900451100	Cerbo-S GX
Supply voltage	8 – 70 VDC		
Power draw without GX Touch	2.8 W @ 12 V		
Power draw with GX Touch	Backlight off: 3.8 W @ 12 V | Backlight at max: 4.8 W @ 12 V		
Mounting	Wall or DIN rail (35 mm) [2]		
Communication ports			
VE.Direct ports (always isolated)	3 (max. possible VE.Direct devices: 15) [3]		
VE.Bus (always isolated)	2 paralleled RJ45 sockets		
VE.Can	Yes - non isolated	Yes VE.Can 1 isolated VE.Can 2 non-isolated	Yes – non-isolated
BMS-Can port	Yes – BMS-Can only	Yes – see VE.Can	No
Bluetooth	Yes [4]		
Ethernet	10/100 RJ45 socket - isolated except shield [7]		
WiFi	Built-in		
USB	2 USB Host ports & 1 power only port	3 USB Host ports	2 USB Host ports & 1 power only port
IO			
Resistive tank level inputs	4		0
Temperature sense inputs	4		0
Digital inputs	4[6]		4[6]
Relays[5]	2 x NO/NC | DC up to 30 VDC: 6 A | DC up to 70 VDC: 1 A | AC: 6 A, 125 VAC		
Other			
Outer dimensions (h x w x d)	78 x 154 x 48 mm		
Operating temperature range	-20 to +50 °C		
IP Rating	IP20		
Standards			
Safety	IEC 62368-1		
EMC	EN 301489-1, EN 301489-17		
Automotive	ECE R10-6		

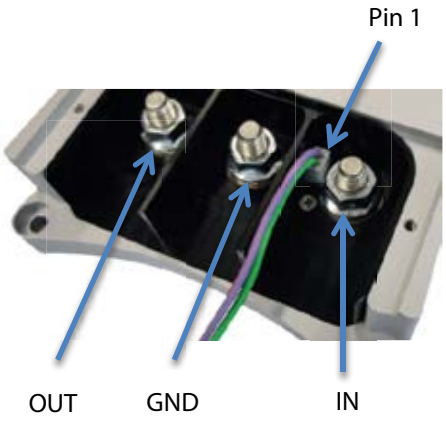
	GX Touch 50 / GX Touch 70	GX Touch 50 Flush / GX Touch 70 Flush
Mounting	Top/wall mount with included mounting accessories	Flush mount or embossed (totally flush)
Protection cover	Included with every GX Touch from serial number HQ2242 Can also be purchased individually: Part # BPP900462050: GX Touch 50 protection cover Part # BPP900462070: GX Touch 70 protection cover	No
Display Resolution	GX Touch 50: 800 x 480GX | Touch 70: 1024 x 600	
IP Rating	IP54 (without connectors)	IP65 (when installed with the included rubber gasket)
Outer dimensions (h x w x d)	GX Touch 50: 87 x 128 x 12.4 mm | GX Touch 70: 113 x 176 x 13.5 mm GX Touch 50 Flush: 94 x 136 x 12 mm | GX Touch 70 Flush: 120 x 184 x 13 mm	
Cable length	2 meter	

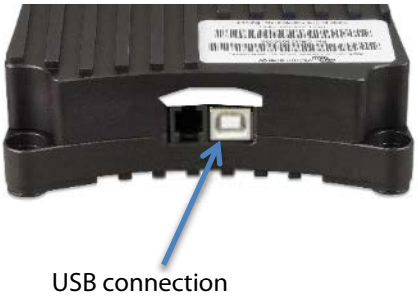
Notes

1. For more detailed information about the Cerbo GX and the GX Touch, please visit the Victron GX product range page at Victron live: www.victronenergy.com/live/venus-os:start
2. DIN rail mounting requires an additional accessory – DIN35 adapter small.
3. The listed maximum in above table is the total connected VE.Direct devices such as MPPT Solar Charge controllers. Total means all directly connected devices plus the devices connected over USB. The limit is mostly bound by CPU processing power. Note that there is also a limit to the other type of devices of which often multiple are connected: PV Inverters. Up to three or four three phase inverters can typically be monitored on a CCGX. Higher power CPU devices can monitor more.
4. Bluetooth functionality is intended to be used to assist with initial connection and networking configuration. You cannot use Bluetooth to connect to other Victron products (e.g. SmartSolar charge controllers).
5. In Cerbo GX hardware there are two relays. Currently, Relay 1 can be used for programming as an alarm relay, generator start/stop, tank pump, temperature-controlled relay or manual operation. Relay 2 is available for programming as a temperature-controlled relay or manual operation in the Relay menu of the GX (requires firmware 2.80 or higher).
6. The digital inputs on the Cerbo GX PN BPP900450100 and Cerbo-S GX are not able to do pulse counting.
7. On Cerbo GX PN BPP900450110 and BPP900451100, the RJ45 sockets are rotated 180 degrees to make it easier to remove the cable.

BUCK-BOOST DC-DC CONVERTER







DC-DC Converter for charging a 12V or 24V service battery in vehicles with a smart alternator (regenerative braking, Euro 5 and Euro 6 engines)

The Buck-Boost DC-DC Converter is a DC-DC Converter for charging a 12V or 24V service battery in vehicles with a smart alternator. The converter will charge the auxiliary battery with a pre-set charge voltage, eliminating high voltages (e.g. Mercedes: 15,4V) and low voltages.

'Engine running' detection system

Deep discharge of the vehicle's starting battery is avoided by a built-in 'engine running' detection system.
Instead of this detection system, the converter can also be activated by means of a programmable input (D+, CAN bus* or (+)15 connection).

Fully programmable

The converter can be fully programmed by means of a simple and user-friendly PC application.
(USB type A male to USB type B male cable needed)

One product for 12V, 24V and 12/24V systems

The converter can be programmed to charge a 12V or a 24V auxiliary battery from either a 12V or a 24V alternator and starter battery.

Charge current and input current limiter

The output current is determined by the following factors:

- The maximum charge current setting.
- The maximum input current setting.
- The maximum operating temperature limit of the converter.

Input status indication (LED)

Green: converter on.
Yellow: input voltage below threshold, converter off.
Red: over temperature, converter off.
Blue, quick flash: engine running, converter will start after preset delay.
Blue, slow flash: the converter is OFF and activation is blocked due to low input voltage.

Output status indication (LED)

Green: converter off, battery voltage normal.
Yellow: converter off, battery voltage low.
Red: converter off, battery discharged or not connected.
Purple: converter on.

*The 25A model does not have a CAN bus connection

Buck-Boost DC-DC Converter	25A	50A	100A
Input voltage range	10-30V		
Under voltage threshold	10V		
Output voltage range	10-30V		
Maximum charge current	12V : 25A 24V : 15A	12V : 50A 24V : 25A	12V : 100A 24V : 50A
Power consumption			
Converter off, LEDs off (power save mode)	7 mA		
On/off input (pin 1, purple wire)			
'On' threshold voltage	> 2V		
Maximum input voltage	30V		
Output pin 1 and pin 2			
Output voltage if activated	V_{pinout} = Vin		
Maximum current (per pin)	I_{pinout} = 1A		
GENERAL			
Operating temperature range	-25 +60°C		
Ambient temperature	Max current: up to 60°C		
Weight	0,6kg	1,4kg	4,1kg
Dimensions	165 x 120 x 30mm	213 x 120 x 30mm	288 x 162 x 95mm

SMART BATTERYPROTECT 65A/100A/220A

Smart BatteryProtect BP-65

Smart BatteryProtect BP-100

Smart BatteryProtect BP-220

Connector with preassembled DC minus cable (included)

Instant Readout via VictronConnect

Protects the battery against excessive discharge and can be used as a system on/off switch
The Smart BatteryProtect disconnects the battery from non-essential loads before it is completely discharged (which would damage the battery) or before it has insufficient power left to crank the engine.
The on/off input can be used as a system on/off switch.

12/24 V auto ranging
The Smart BatteryProtect automatically detects system voltage one time only.

Bluetooth: programming made easy
When using Bluetooth to program the Smart BatteryProtect any required engage/disengage levels can be set.
Alternatively, one of nine predefined engage/disengage levels can be set with the programming pin (see manual).
If required, Bluetooth can be disabled.

Instant Readout
VictronConnect can display the most important data of the Smart BatteryProtect on the Device List page without the need to pair with the product. This includes visual notifications of warnings, alarms, and errors that enable diagnostics at a glance.

A special setting for Li-ion batteries
In this mode the BatteryProtect can be controlled by the VE.Bus BMS.
Note: the BatteryProtect can also be used as a charge interrupter in between a battery charger and a Li-ion battery. See connection diagram in the manual.

Ultra-low current consumption
This is important in case of Li-ion batteries, especially after low voltage shutdown.
Please see our Li-ion battery datasheet and the VE.Bus BMS manual for more information.

Over voltage protection
To prevent damage to sensitive loads due to over voltage, the load is disconnected whenever the DC voltage exceeds 16.3V respectively 32.6V.

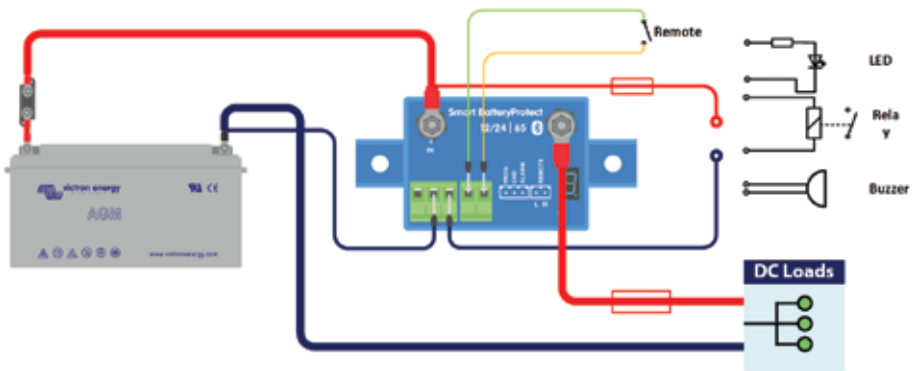
Ignition proof
No relays but MOSFET switches, and therefore no sparks.

Delayed alarm output
The alarm output is activated if the battery voltage drops below the preset disconnect level during more than 12 seconds. Starting the engine will therefore not activate the alarm. The alarm output is a short circuit proof open collector output to the negative (minus) rail, max. current 50 mA. The alarm output is typically used to activate a buzzer, LED or relay.

Delayed load disconnect and delayed reconnect
The load will be disconnected 90 seconds after the battery voltage drops below the preset level. If the battery voltage increases again to the connect threshold within this time period (after the engine has been started for example), the load will not be disconnected.
The load will be reconnected 30 seconds after the battery voltage has increased to more than the preset reconnect voltage.

Smart BatteryProtect		Smart BP-65	Smart BP-100	Smart BP-220
Maximum continuous load current*		65 A	100 A	220 A
Peak current (during 30 seconds)		250 A	600 A	600 A
Operating voltage range		6 –35 V		
Current consumption	BLE On	When on: 1,4 mA When off or low voltage shutdown: 0,9 mA		
	BLE Off	When on: 1,2 mA When off or low voltage shutdown: 0,7 mA		
Alarm output delay		12 seconds		
Maximum load on alarm output		50 mA (short circuit proof)		
Load disconnect delay		90 seconds (immediate if triggered by the VE.Bus BMS)		
Load reconnect delay		30 seconds		
Default thresholds		Disengage: 10,5 V or 21 V Engage: 12 V or 24 V		
Operating temperature range		Full load: -40°C to +40°C (up to 60% of nominal load at 50°C)		
IP rating		Electronics: IP67 (potted) Connections: IP00		
Connection		M6	M8	M8
Mounting Torque		5 Nm	9 Nm	9 Nm
Weight		0,2 kg 0.5 lbs	0,5 kg 0.6 lbs	0,8 kg 1.8 lbs
Dimensions (hxwxd)		48 x 55 x 106 mm 1.9 x 2.2 x 4.2 inch	61 x 41 x 164 mm 2.4 x 1.6 x 6.5 inch	60 x 123 x 121 mm 2.4 x 4.8 x 4.8 inch

* The BatteryProtect is not designed for reverse currents from charging sources



CYRIX -CT 12/24 V 120 A AND 230 A

Cyrix-ct 12/24-120

LED status indicator

Cyrix-ct 12/24-230

Control cable for
Cyrix-ct 12/24-230
Length: 1 m

Intelligent battery monitoring to prevent unwanted switching

Some battery combiners (also called voltage controlled relay, or split charge relay) will disconnect a battery in case of a short but high amperage load. A battery combiner also may fail to connect a large but discharged battery bank because the DC voltage immediately drops below the disengage value once the batteries are connected.
The software of the Cyrix-ct 12/24 does more than simply connect and disconnect based on battery voltage and with a fixed time delay. The Cyrix-ct 12/24 looks at the general trend (voltage increasing or decreasing) and reverses a previous action only if the trend has reversed during a certain period of time. The time delay depends on the voltage deviation from the trend.
(for Battery Combiners with multiple engage/disengage profiles, please see the Cyrix-i 400)

Long bolts to allow connection of more than one power cable

Cyrix 12/24-120: 13 mm (M6) Cyrix 12/24-230: 16 mm (M8)

Protection against overheating (due to a long duration overload e.g.)

The Cyrix will disengage in case of excessive contact temperature, and reengage again after it has cooled down.

LED status indication (Cyrix 12/24 230 only)

LED on: engaged LED 10 s flash: disengaged
LED 2 s flash: connecting LED 2 s blink: disconnecting
LED 0,25 s blink: alarm (over temperature; voltage > 16 V; both batteries < 10 V; one battery < 2 V)
(multiply by two for 24 V)

12/24 V auto ranging

The Cyrix-ct 12/24 automatically detects system voltage.

No voltage loss

Cyrix battery combiners are an excellent replacement for diode isolators. The main feature is that there is virtually no voltage loss so that the output voltage of alternators or battery chargers does not need to be increased.

Prioritising the starter battery

In a typical setup the alternator is directly connected to the starter battery. The accessory battery, and possibly also a bow thruster and other batteries are each connected to the starter battery with Cyrix battery combiners. When a Cyrix senses that the starter battery has reached the connect voltage it will engage, to allow for parallel charging of the other batteries.

Bidirectional voltage sensing and power supply from both batteries

The Cyrix senses the voltage of both connected batteries. It will therefore also engage if for example the accessory battery is being charged by a battery charger.
The Cyrix-ct 12/24 has a dual power supply. It will therefore also close if the voltage on one battery is too low to operate the Cyrix.
In order to prevent unexpected operation during installation or when one battery has been disconnected, the Cyrix-ct 12/24 will not close if the voltage on one of the two battery connections is lower than 2 V (12 V battery) or 4 V (24 V battery).

Parallel connection in case of emergency (Start Assist)

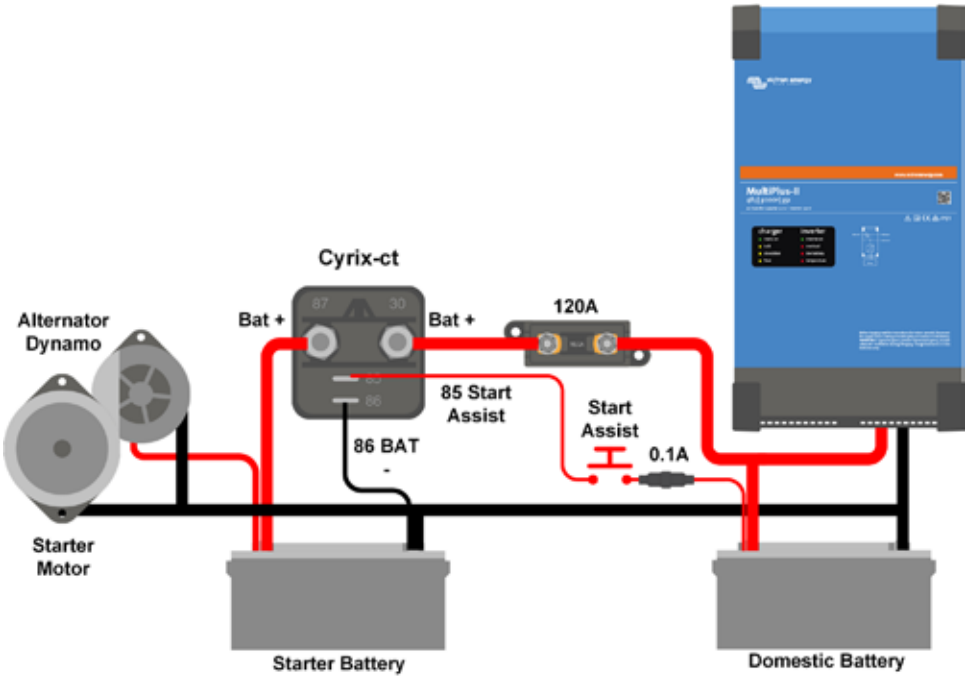
The Cyrix can also be engaged with a push button (Cyrix remains engaged during 30 seconds) or a switch to connect batteries in parallel manually.
This is especially useful in case of emergency when the starter battery is discharged or damaged.

Cyrix Battery Combiner	Cyrix-ct 12/24-120	Cyrix-ct 12/24-230
LED status indication	No	Yes
Continuous current	120 A	230 A
Cranking rating (5 seconds)	180 A	500 A
Connect voltage	From 13 V to 13,8 V and 26 to 27,6 V with intelligent trend detection	
Disconnect voltage	From 11 V to 12,8 V and 22 to 25,7 V with intelligent trend detection	
Current consumption when open	<4 mA	
Current consumption when closed	12 V : 220 mA 24 V : 120 mA	12 V : 320 mA 24 V : 180 mA
Start Assist	Yes (Cyrix remains engaged during 30 seconds)	
Control cable included (length 1 m)	No	Yes
Protection category	IP54	
Weight kg (lbs)	0,11 (0.24)	0,27 (0.6)
Dimensions h x w x d in mm (h x w x d in inches)	46 x 46 x 80 (1.8 x 1.8 x 3.2)	65 x 100 x 50 (2.6 x 4.0 x 2.0)

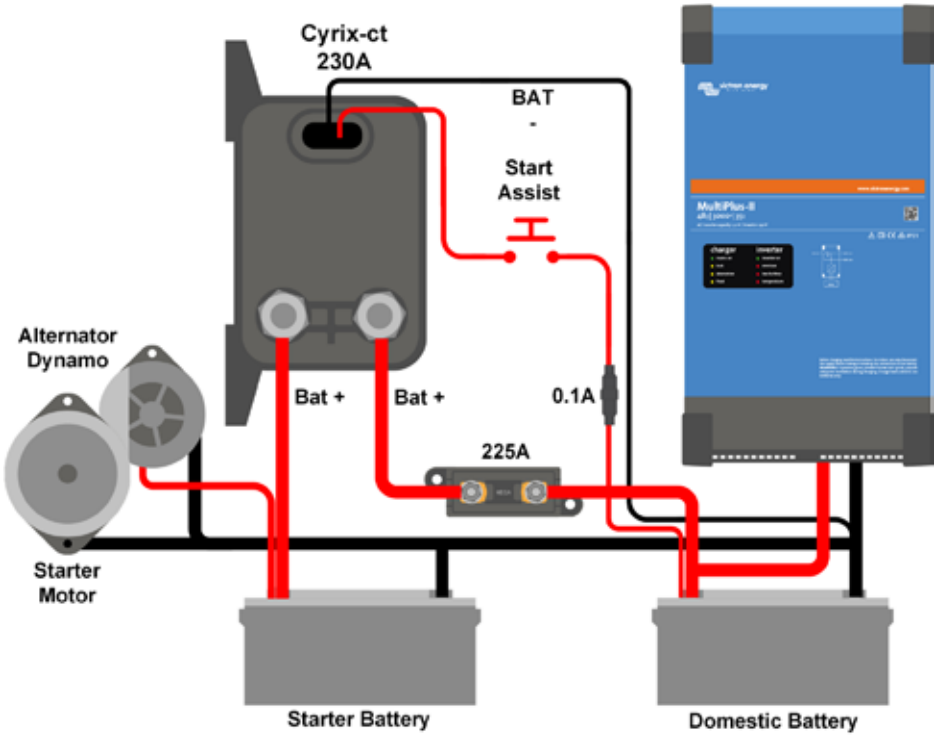
Connect (V)	Delay
V < 13 V	Remains open
13,0 V < V < 13,2 V	10 min
13,2 V < V < 13,4 V	5 min
13,4 V < V < 13,6 V	1 min
13,6 V < V < 13,8 V	4 sec

Disconnect (V)	Delay
V < 11 V	0 sec
11,0 V < V < 12,0 V	1 sec
12,0 V < V < 12,2 V	10 sec
12,2 V < V < 12,4 V	30 sec
12,4 V < V < 12,8 V	3 min
> 12,8 V	remains closed
> 16 V	over voltage disconnect

Approximate connect and disconnect delay
(multiply by two for a 24 V system)



Cyrix-ct 12/24-120: connection diagram



Cyrix-ct 12/24-230: connection diagram

CYRIX-I 400A 12/24V AND 24/48V

Cyrix-i 24/48 V 400 A

New: intelligent battery monitoring to prevent unwanted switching

Some battery combiners will disconnect a battery in case of a short but high amperage load. A battery combiner also may fail to connect a large but discharged battery bank because the DC voltage immediately drops below the disengage value once the batteries are connected.
The software of the Cyrix-i does more than simply connect and disconnect based on battery voltage and with a fixed time delay. The Cyrix-i looks at the general trend (voltage increasing or decreasing) and reverses a previous action only if the trend has reversed during a certain period of time. The time delay depends on the voltage deviation from the trend.

In addition, four switch timing profiles can be chosen (see back page).

12/24 V and 24/48 V auto ranging

The Cyrix-i automatically detects system voltage.

No voltage loss

Cyrix battery combiners are an excellent replacement for diode isolators. The main feature is that there is virtually no voltage loss so that the output voltage of alternators or battery chargers does not need to be increased.

Prioritizing the starter battery

In a typical setup the alternator is directly connected to the starter battery. The accessory battery, and possibly also a bow thruster and other batteries are each connected to the starter battery with Cyrix battery combiners. When a Cyrix senses that the starter battery has reached the connect voltage it will engage, to allow for parallel charging of the other batteries.

Bidirectional voltage sensing and power supply from both batteries

The Cyrix senses the voltage of both connected batteries. It will therefore also engage if for example the accessory battery is being charged by a battery charger.
The Cyrix-i has a dual power supply. It will therefore also close if the voltage on one battery is too low to operate the Cyrix.
In order to prevent unexpected operation during installation or when one battery has been disconnected, the Cyrix-i will not close if the voltage on one of the two battery connections is lower than 2 V (12 V battery), or 4 V (24 V battery) or 8 V (48 V battery).

Parallel connection in case of emergency

The Cyrix can also be engaged with a push button (Cyrix remains engaged during 30 s) or a switch to connect batteries in parallel manually.
This is especially useful in case of emergency when the starter battery is discharged or damaged.

Model	Cyrix-i 12/24-400 Cyrix-i 24/48-400
Continuous current	400A
Peak current	2000A during 1 second
Input voltage 12/24 V model Input voltage 24/48 V model	8-36 VDC 16-72 VDC
Connect/disconnect profiles	See table
Over voltage disconnect	16 V / 32 / 64 V
Current consumption when open	4 mA
Emergency start	Yes, 30 s
Micro switch for remote monitoring	Yes
Status indication	Bicolour LED
Weight kg (lbs)	0,9 (2.0)
Dimensions h x w x d in mm (h x w x d in inches)	78 x 102 x 110 (3.1 x 4.0 x 4.4)

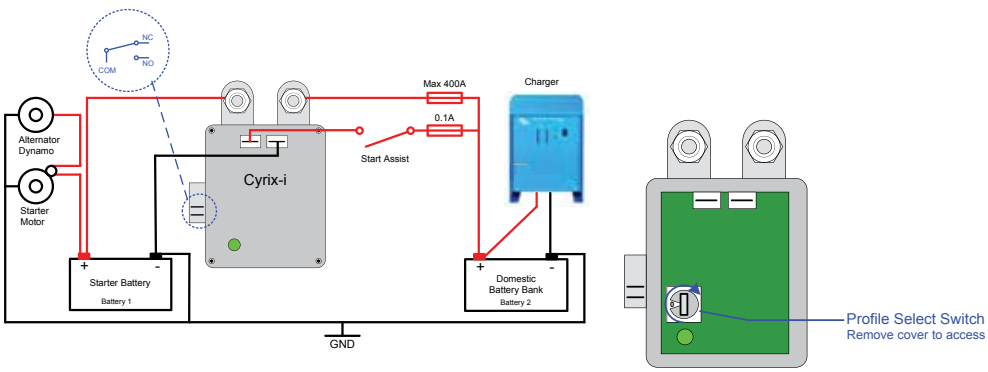
Profile 0			
Connect (V)*		Disconnect (V)*	
Less than 13 V	Remains open	More than 12,8 V	Remains closed
	Closes after		Opens after
13 V	10 min	12,8 V	10 min
13,2 V	5 min	12,4 V	5 min
13,4 V	3 min	12,2 V	1 min
13,6 V	1 min	12 V	4 sec
13,8 V	4 sec	Less than 11 V	Immediate

Profile 1			
Connect (V)*		Disconnect (V)*	
Less than 13,25 V	Remains open	More than 12,75 V	Remains closed
More than 13,25 V	Closes after 30 sec	From 10,5 V to 12,75 V	Opens after 2 min
		Less than 10,5 V	Immediate

Profile 2			
Connect (V)*		Disconnect (V)*	
Less than 13,2 V	Remains open	More than 12,8 V	Remains closed
More than 13,2 V	Closes after 6 sec	From 10,5 V to 12,8 V	Opens after 30 sec
		Less than 10,5 V	Immediate

Profile 3			
Connect (V)*		Disconnect (V)*	
Less than 13,25 V	Remains open	More than 13,5 V	Remains closed
	Closes after		Opens after
13 V	10 min	12,8 V	30 min
13,2 V	5 min	12,4 V	12 min
13,4 V	3 min	12,2 V	2 min
13,6 V	1 min	12 V	1 min
13,8 V	4 sec	Less than 10,5 V	Immediate

NOTES
1) After connecting 3 times, the minimum time to reconnect is 1 minute (to prevent 'rattling')
2) The Cyrix will not connect if the voltage on one of the battery connections is less than 2 V*. (to prevent unexpected switching during installation)
3) The Cyrix will always connect if the **start assist** is activated, as long as the voltage on one of the battery connections is sufficient to operate the Cyrix (approximately 10 V*)
* Multiply voltage x2 for 24 V systems and x4 for 48 V systems



SMARTSHUNT 300A / 500A / 1000A / 2000A

SmartShunt 300 A

SmartShunt 500 A

SmartShunt 1000 A

SmartShunt 2000 A

The SmartShunt is an all-in-one battery monitor, only without a display. Your phone acts as the display.

The SmartShunt connects via Bluetooth to the VictronConnect app on your phone (or tablet) and you can conveniently read out all monitored battery parameters, like state of charge, time to go, historical information and much more.

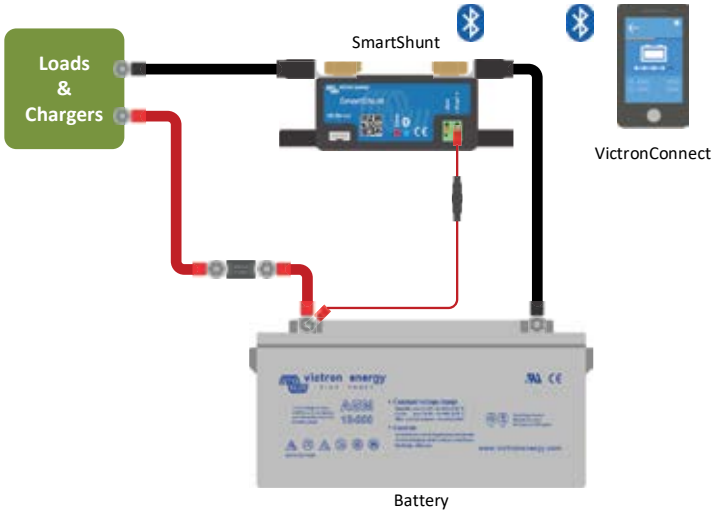
Alternatively, the SmartShunt can be connected and be read by a GX device. Connection to the SmartShunt is made via a VE.Direct cable.

The SmartShunt is a good alternative for a BMV battery monitor, especially for systems where battery monitoring is needed but less wiring and clutter is wanted.

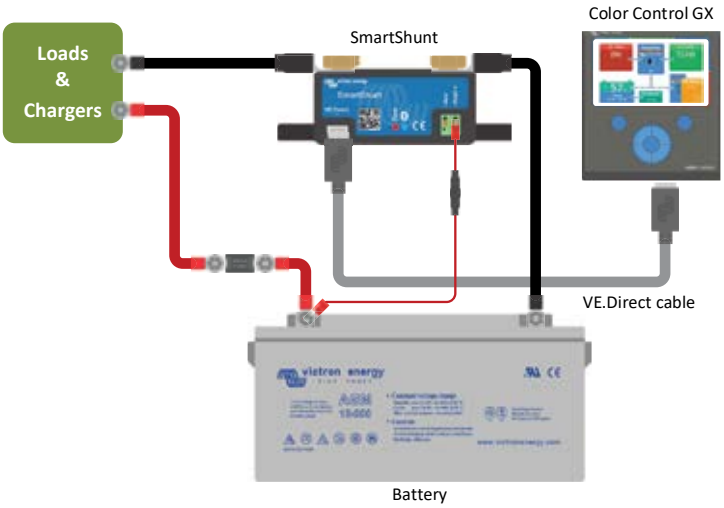
The SmartShunt is equipped with Bluetooth, a VE.Direct port and a connection that can be used to monitor a second battery, for midpoint monitoring, or to connect a temperature sensor.

Differences compared to BMV-712 Battery Monitor

- No programmable visual and audible alarm.
- No programmable relay.

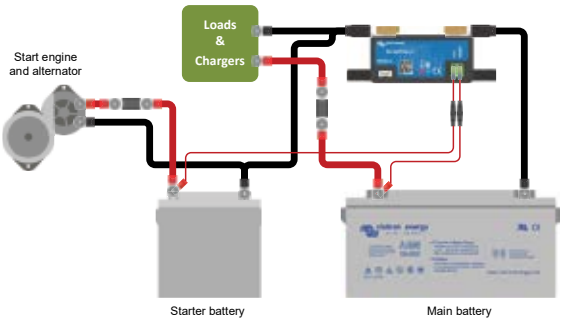


Basic SmartShunt wiring

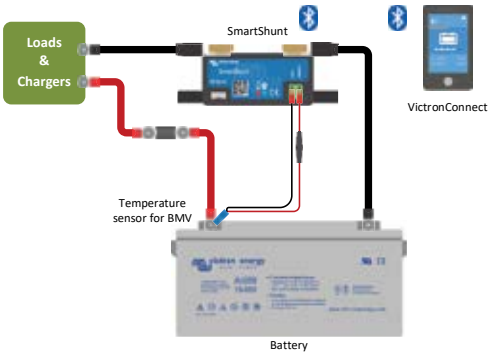


Connecting a SmartShunt to a GX device

SmartShunt	300 A / 500 A / 1000 A / 2000 A
Supply voltage range	6.5 - 70 VDC
Current draw	< 1mA
Input voltage range, auxiliary battery	6.5 - 70 VDC
Battery capacity (Ah)	1 - 9999 Ah
Operating temperature range	-40 +50°C (-40 - 120°F)
Measures voltage of second battery, or temperature, or midpoint	Yes
Temperature measurement range	-20 +50°C
VE.Direct communication port	Yes
RESOLUTION & ACCURACY	
Current	± 0.01 A
Voltage	± 0.01 V
Amp hours	± 0.1 Ah
State of charge (0 – 100 %)	± 0.1 %
Time to go	± 1 min
Temperature (if optional temperature sensor connected)	± 1 °C/°F (0 – 50 °C or 30 – 120 °F)
Accuracy of current measurement	± 0.4 %
Offset	Less than 10 / 10 / 20 / 40 mA
Accuracy of voltage measurement	± 0.3 %
INSTALLATION & DIMENSIONS	
Dimensions (h x w x d)	300 A: 44 x 120 x 44 mm 500 A: 46 x 120 x 54 mm 1000 A: 68 x 168 x 75 mm 2000 A: 68 x 168 x 100 mm
Shunt connection bolts	300 A: M8 500 A, 1000 A, 2000 A: M10 (0.3937 inch)
Protection category	IP21
STANDARDS	
Safety	EN 60335-1
Emission / Immunity	EN-IEC 61000-6-1 EN-IEC 61000-6-2 EN-IEC 61000-6-3
Automotive	EN 50498
ACCESSORIES	
Cables (included)	Two cables with 1 A fuse, for '+' connection and starter battery or midpoint connection
Temperature sensor	Optional (ASS000100000)
A note regarding the range of the Bluetooth signal	The shunt and the electric cables do negatively influence the range of the Bluetooth signal. The resulting range of 10-15 meter is however satisfactory in most cases. The proximity of other electrically conducting elements, such as the metal chassis of a vehicle or seawater around the hull if a boat, may reduce the range of the Bluetooth signal to an unacceptable level. The solution in such a case is to add a VE.Direct Bluetooth Dongle (ASS030536011) to the system, and to switch off Bluetooth in the SmartShunt.
STORED TRENDS	
Data stored	Battery voltage, Current, State of Charge % as well as the Aux input (Battery temperature, or midpoint deviation, or starter battery voltage).
Number of days trends data is stored	46

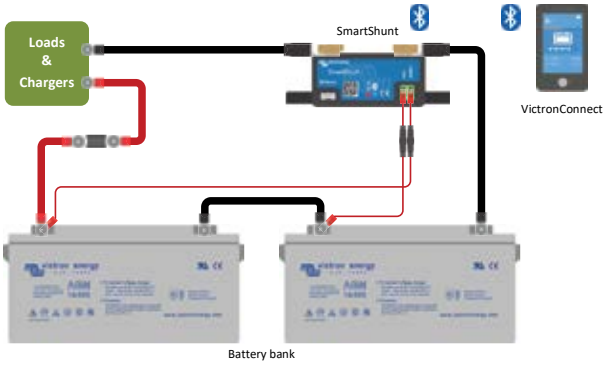


Measuring voltage of the starter battery



Measuring battery temperature

Stored trends for SmartShunt



Measuring battery bank midpoint

SMARTSHUNT IP65 300A / 500A / 1000A / 2000A

SmartShunt IP65 300 A

SmartShunt IP65 500 A

SmartShunt IP65 1000 A

SmartShunt IP65 2000 A

The SmartShunt IP65 is an all-in-one battery monitor, only without a display. Your phone acts as the display.

The SmartShunt IP65 is water resistant and is available in a 300 A, 500 A, 1000 A or 2000 A version.

The SmartShunt IP65 connects via Bluetooth to the VictronConnect app on your phone (or tablet) and you can conveniently read out all monitored battery parameters, like state of charge, time to go, historical information and much more.

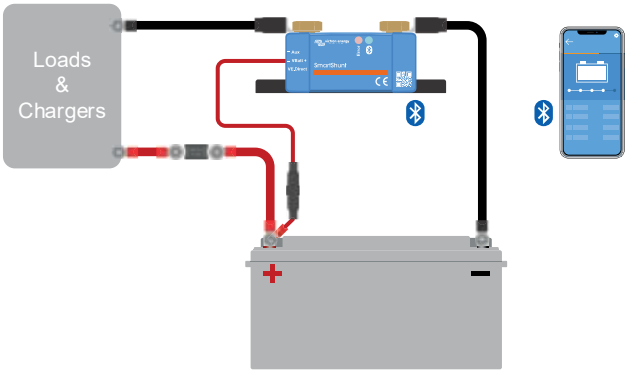
Alternatively, the SmartShunt IP65 can be connected and be read by a GX device. Connection to the SmartShunt is made via a VE.Direct cable.

The SmartShunt is a good alternative for a BMV battery monitor, especially for systems where battery monitoring is needed but less wiring and clutter is wanted.

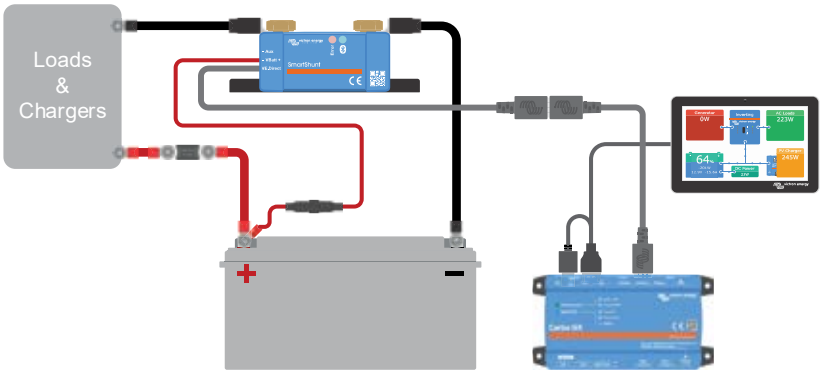
The SmartShunt is equipped with Bluetooth, has a VE.Direct port and an auxiliary connection that can be used to monitor a second battery, for midpoint monitoring, or to connect a temperature sensor.

Differences compared to BMV-712 Battery Monitor

- No visual and audible alarm (alarms are only visible via the VictronConnect app or GX device).
- No programmable relay.
- Waterproof.
- The shunt is attached to the battery monitor unit.

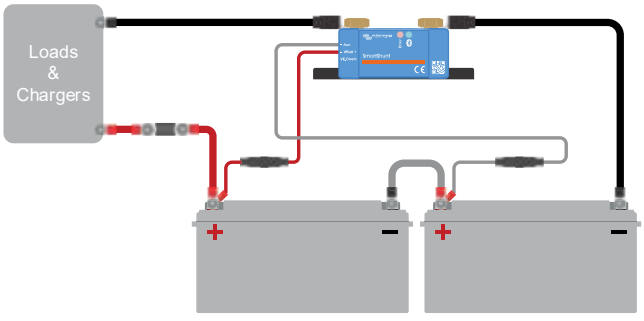


Basic SmartShunt wiring

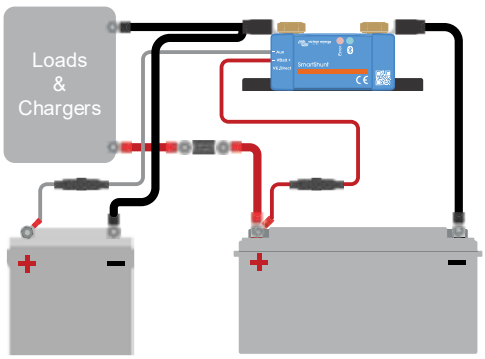


Connecting a SmartShunt to a GX device

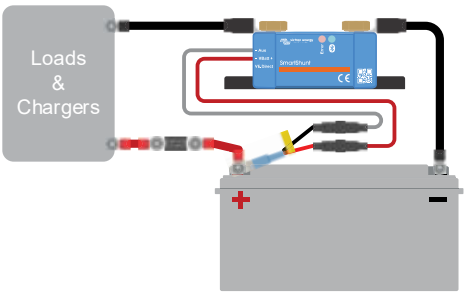
SmartShunt IP65	300 A / 500 A / 1000 A / 2000 A
Supply voltage range	6.5 - 70 VDC
Current draw	< 1 mA
Input voltage range, auxiliary battery	6.5 - 70 VDC
Battery capacity (Ah)	1 - 9999 Ah
Operating temperature range	-40 +50 °C (-40 – 120 °F)
Measures voltage of second battery, or temperature, or midpoint	Yes
Temperature measurement range	-20 +50 °C
VE.Direct communication port	Yes
RESOLUTION & ACCURACY	
Current	± 0.01 A
Voltage	± 0.01 V
Amp hours	± 0.1 Ah
State of charge (0 – 100 %)	± 0.1 %
Time to go	± 1 min
Temperature (if optional temperature sensor connected)	± 1 °C/°F (0 – 50 °C or 30 – 120 °F)
Accuracy of current measurement	± 0.4 %
Offset	Less than 10 / 10 / 20 / 40 mA
Accuracy of voltage measurement	± 0.3 %
INSTALLATION & DIMENSIONS	
Dimensions (h x w x d)	300A: 44 x 120 x 38 mm 500A: 46 x 120 x 54 mm 1000A: 68 x 168 x 75 mm 2000A: 68 x 168 x 100 mm
Shunt connection bolts	300 A: M8 500 A, 1000 A, 2000 A: M10 (0.3937 inch)
Protection category	IP65
STANDARDS	
Safety	EN 60335-1
Emission / Immunity	EN-IEC 61000-6-1 EN-IEC 61000-6-2 EN-IEC 61000-6-3
Automotive	EN 50498
Cables	Two 1.5 m cables with 1 A fuse, for '+' connection and starter battery or midpoint connection
VE.Direct cable	1.5 m cable with a VE.Direct socket. Note that a (not included) VE.Direct cable is needed to connect a GX device.
Temperature sensor	Optional (ASS000100000)
A note regarding the range of the Bluetooth signal	The shunt and the electric cables do negatively influence the range of the Bluetooth signal. The resulting range of 10-15 meter is however satisfactory in most cases. The proximity of other electrically conducting elements, such as the metal chassis of a vehicle or seawater around the hull if a boat, may reduce the range of the Bluetooth signal to an unacceptable level. The solution in such a case is to add a VE.Direct Bluetooth Dongle (ASS030536011) to the system, and to switch off Bluetooth in the SmartShunt.
STORED TRENDS	
Data stored	Battery voltage, Current, State of Charge % as well as the Aux input (Battery temperature, or midpoint deviation, or starter battery voltage).
Number of days trends data is stored	46



Measuring battery bank midpoint



Measuring voltage of the starter battery



Measuring battery temperature

Stored trends for SmartShunt

BMV-712 SMART: BLUETOOTH INSIDE

BMV-712 Smart

BMV bezel square

BMV shunt 500A/50mV
With quick connect pcb

See the VictronConnect BMV app Discovery Sheet for more screenshots

Bluetooth inside

With Bluetooth built-in, the BMV Smart is ready for the Internet of Things (IoT) era. With Bluetooth being implemented in most other Victron Energy products, wireless communication between products will simplify system installation and enhance performance.

Download the Victron Bluetooth app

Use a smartphone or other Bluetooth enabled device to

- customize settings,
- monitor all important data on single screen,
- view historical data, and to
- update the software when new features become available.

Easy to install

All electrical connections are to the quick connect PCB on the current shunt. The shunt connects to the monitor with a standard RJ12 telephone cable. Included: RJ12 cable (10 m) and battery cable with fuse (2 m); no other components needed.

Also included are a separate front bezel for a square or round display appearance, a securing ring for rear mounting and screws for front mounting.

Midpoint voltage monitoring

One bad cell or one bad battery can destroy a large, expensive battery bank. When batteries are connected in series, a timely warning can be generated by measuring the midpoint voltage. Please see the BMV manual, section 5.2, for more information.
We recommend our **Battery Balancer** (BMS012201000) to maximize service life of series-connected lead-acid batteries.

Very low current draw from the battery

Current consumption: 0.7 Ah per month (1 mA) @12 V and 0.6 Ah per month (0.8 mA) @ 24 V
Especially Li-ion batteries have virtually no capacity left when discharged until low voltage shutdown.
After shutdown due to low cell voltage, the capacity reserve of a Li-ion battery is approximately 1Ah per 100 Ah battery capacity. The battery will be damaged if the remaining capacity reserve is drawn from the battery.
A residual current of 10 mA for example may damage a 200 Ah battery if the system is left in discharged state during more than 8 days.

Bi-stable alarm relay

Prevents increased current draw in case of an alarm.

Other features

- Battery voltage, current, power, ampere-hours consumed and state of charge
- Remaining time at the current rate of discharge
- Programmable visual and audible alarm
- Programmable relay, to turn off non critical loads or to run a generator when needed
- 500 Amp quick connect shunt and connection kit
- Shunt selection capability up to 10,000 Amps
- VE.Direct communication port
- Stores a wide range of historical events, which can be used to evaluate usage patterns and battery health
- Wide input voltage range: 6.5 – 70 V
- High current measurement resolution: 10 mA (0.01 A)
- Additional input to measure voltage (of a second battery), temperature or midpoint voltage, and corresponding alarm and relay settings

Battery Monitor	BMV-712 Smart
Supply voltage range	6.5 - 70 VDC
Current draw, back light off	< 1 mA
Input voltage range, auxiliary battery	6.5 - 70 VDC
Battery capacity (Ah)	1 - 9999 Ah
Operating temperature range	-40 +50 °C (-40 – 120 °F)
Measures voltage of second battery, or temperature, or midpoint	Yes
Temperature measurement range	-20 +50 °C
VE.Direct communication port	Yes
Bistable relay	60V / 1A normally open (function can be inverted)
RESOLUTION & ACCURACY (with a 500 A shunt)	
Current	± 0.01 A
Voltage	± 0.01 V
Amp hours	± 0.1 Ah
State of charge (0 – 100%)	± 0.1 %
Time to go	± 1 min
Temperature (0 - 50°C or 30 - 120°F)	± 1 °C/°F
Accuracy of current measurement	± 0.4 %
Accuracy of voltage measurement	± 0.3 %
INSTALLATION & DIMENSIONS	
Installation	Flush mount
Front	63mm diameter
Front bezel	69 x 69mm (2.7 x 2.7 inch)
Shunt connections bolts	M10 (0.3937 inch)
Body diameter and depth	52 mm (2.0 inch) and 31 mm (1.2 inch)
Protection category	IP55 (not intended for outdoor use)
STANDARDS	
Safety	EN 60335-1
Emission / Immunity	EN 55014-1 / EN 55014-2
Automotive	ECE R10-4 / EN 50498
ACCESSORIES	
Shunt (included)	500 A / 50 mV
Cables (included)	10 meter 6 core UTP with RJ12 connectors, and cable with 1 Amp slow blow fuse for '+' connectio
Temperature sensor	Optional (ASS000100000)
STORED TRENDS	
Data stored	Battery voltage, Current, State of Charge % as well as the Aux input (Battery temperature, or midpoint deviation, or starter battery voltage).
Number of days trends data is stored	46

1000A/50 mV, 2000 A/50 mV and 6000 A/50 mV shunt
The quick connect PCB on the standard 500 A/50 mV shunt can also be mounted on these shunts.

Interface cables
- VE.Direct cables to connect a BMV 712 to the Color Control (ASS030530xxx)
- VE.Direct to USB interface (ASS030530000) to connect several BMV 70x to a Color Control GX or to a computer.

Temperature sensor

Battery Balancer (BMS012201000)
The Battery Balancer equalizes the state of charge of two series connected 12V batteries, or of several parallel strings of series connected batteries.
When the charge voltage of a 24 V battery system increases to more than 27 V, the Battery Balancer will turn on and compare the voltage over the two series connected batteries. The Battery Balancer will draw a current of up to 1A from the battery (or parallel connected batteries) with the highest voltage. The resulting charge current differential will ensure that all batteries will converge to the same state of charge.

If needed, several balancers can be paralleled.

A 48 V battery bank can be balanced with three Battery Balancers.

Color Control
The powerful Linux computer, hidden behind the colour display and buttons, collects data from all Victron equipment and shows it on the display. Besides communicating with Victron equipment, the Color Control communicates through CAN bus (NMEA 2000), Ethernet and USB.
Data can be stored and analysed on the VRM Portal.

A maximum of four BMVs can be connected directly to a Color Control GX.
Even more BMVs can be connected to a USB Hub for central monitoring.

Venus GX
The Venus GX provides intuitive control and monitoring. It has the same functionality as the Color Control GX, with a few extras:
- lower cost, mainly because it has no display or buttons
- 3 tank sender inputs
- 2 temperature inputs

BMV-700 SERIES: PRECISION BATTERY MONITORING

BMV-700

BMV bezel square

BMV shunt 500A/50mV
With quick connect pcb

BMV-702 Black

BMV-700H

Battery 'fuel gauge', time-to-go indicator, and much more

The remaining battery capacity depends on the ampere-hours consumed, discharge current, temperature and the age of the battery. Complex software algorithms are needed to take all these variables into account.

Next to the basic display options, such as voltage, current and ampere-hours consumed, the BMV-700 series also displays state of charge, time to go, and power consumption in Watts.

The BMV-702 features an additional input which can be programmed to measure the voltage (of a second battery), battery temperature or midpoint voltage (see below).

Bluetooth Smart

Use the Bluetooth Smart dongle to monitor your batteries on Apple or Android smartphones, tablets, macbooks and other devices.

Easy to install

All electrical connections are to the quick connect PCB on the current shunt. The shunt connects to the monitor with a standard RJ12 telephone cable. Included: RJ12 cable (10m) and battery cable with fuse (2m); no other components needed.

Also included are a separate front bezel for a square or round display appearance, a securing ring for the rear mounting and screws for the front mounting.

Easy to program (with your smartphone!)

A quick install menu and a detailed setup menu with scrolling texts assist the user when going through the various settings.

Alternatively, choose the fast and easy solution: download the smartphone app (Bluetooth Smart dongle needed)

Midpoint voltage monitoring (BMV-702 only)

This feature, which is often used in industry to monitor large and expensive battery banks, is now for the first time made available at a low cost, to monitor any battery bank.

A battery bank consists of a string of series connected cells. The midpoint voltage is the voltage halfway along the string. Ideally, the midpoint voltage would be exactly half of the total voltage. In practice, however, deviations will be seen, that depend on many factors such as a different state of charge for new batteries or cells, different temperatures, internal leakage currents, capacities and much more.

Large or increasing deviation of the midpoint voltage, points to improper battery care or a failed battery or cell. Corrective action following a midpoint voltage alarm can prevent severe damage to an expensive battery. Please consult the BMV manual for more information.

Standard features

- Battery voltage, current, power, ampere-hours consumed and state of charge
- Remaining time at the current rate of discharge
- Programmable visual and audible alarm
- Programmable relay, to turn off non critical loads or to run a generator when needed
- 500 Amp quick connect shunt and connection kit
- Shunt selection capability up to 10,000 Amps
- VE.Direct communication port
- Stores a wide range of historical events, which can be used to evaluate usage patterns and battery health
- Wide input voltage range: 6.5 – 95V
- High current measurement resolution: 10 mA (0.01A)
- Low current consumption: 2.9Ah per month (4mA) @12V and 2.2Ah per month (3mA) @ 24V

BMV-702 additional features

Additional input to measure voltage (of a second battery), temperature or midpoint voltage, and corresponding alarm and relay settings.

BMV-700H: 60 to 385 VDC voltage range

No additional parts needed. Note: suitable for systems with grounded negative only (battery monitor is not isolated from shunt).

Other battery monitoring options

- Lynx Shunt VE.Can

More about midpoint voltage

One bad cell or one bad battery can destroy a large, expensive battery bank. When batteries are connected in series, a timely warning can be generated by measuring the midpoint voltage. Please see the BMV manual, section 5.2, for more information.
We recommend our Battery Balancer (BMS012201000) to maximize service life of series-connected batteries.

Battery Monitor	BMV-700	BMV-702 BMV-702 BLACK	BMV-700H
Supply voltage range	6.5 - 95 VDC	6.5 - 95 VDC	60 – 385 VDC
Current draw, back light off	< 4mA	< 4mA	< 4mA
Input voltage range, auxiliary battery	n. a.	6.5 - 95 VDC	n. a.
Battery capacity (Ah)	1 - 9999 Ah		
Operating temperature range	-40 +50°C (-40 - 120°F)		
Measures voltage of second battery, or temperature, or midpoint	No	Yes	No
Temperature measurement range	-20 +50°C		n. a.
VE.Direct communication port	Yes	Yes	Yes
Relay	60V / 1A normally open (function can be inverted)		
RESOLUTION & ACCURACY (with a 500 A shunt)			
Current	± 0.01A		
Voltage	± 0.01V		
Amp hours	± 0.1 Ah		
State of charge (0 – 100%)	± 0.1%		
Time to go	± 1 min		
Temperature (0 - 50°C or 30 - 120°F)	n. a.	± 1°C/°F	n. a.
Accuracy of current measurement	± 0.4%		
Accuracy of voltage measurement	± 0.3%		
INSTALLATION & DIMENSIONS			
Installation	Flush mount		
Front	63mm diameter		
Front bezel	69 x 69 mm (2.7 x 2.7 inch)		
Shunt connection bolts	M10 (0.3937 inch)		
Body diameter and depth	52 mm (2.0 inch) and 31 mm (1.2 inch)		
Protection category	IP55 (not intended for outdoor use)		
STANDARDS			
Safety	EN 60335-1		
Emission / Immunity	EN 55014-1 / EN 55014-2		
Automotive	ECE R10-4 / EN 50498		
ACCESSORIES			
Shunt (included)	500A / 50mV		
Cables (included)	10 meter 6 core UTP with RJ12 connectors, and cable with 1Amp slow blow fuse for '+' connection		
Temperature sensor	Optional (ASS000100000)		

1000A/50mV, 2000A/50mV and 6000A/50mV shunt
The quick connect PCB on the standard 500A/50mV shunt can also be mounted on these shunts.

Interface cables
- VE.Direct cables to connect a BMV 70x to the Color Control (ASS030530xxx)
- VE.Direct to USB interface (ASS030530000) to connect several BMV 70x to a Color Control GX or to a computer.

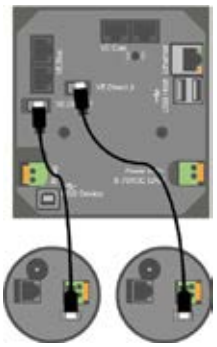
With the **VE.Direct to Bluetooth Smart dongle** real time data and alarms can be displayed on Apple and Android smartphones, tablets, macbooks and other devices.

Also use your smartphone to adjust settings!

(the VE.Direct to Bluetooth Smart dongle must be ordered separately)

See the VictronConnect BMV app Discovery Sheet for more screenshots

Color Control
The powerful Linux computer, hidden behind the colour display and buttons, collects data from all Victron equipment and shows it on the display. Besides communicating with Victron equipment, the Color Control communicates through CAN bus (NMEA2000), Ethernet and USB. Data can be stored and analysed on the VRM Portal.



Temperature sensor

A maximum of four BMVs can be connected directly to a Color Control GX.
Even more BMVs can be connected to a USB Hub for central monitoring.

Battery Balancer (BMS012201000)
The Battery Balancer equalizes the state of charge of two series connected 12V batteries, or of several parallel strings of series connected batteries.
When the charge voltage of a 24V battery system increases to more than 27V, the Battery Balancer will turn on and compare the voltage over the two series connected batteries. The Battery Balancer will draw a current of up to 1A from the battery (or parallel connected batteries) with the highest voltage. The resulting charge current differential will ensure that all batteries will converge to the same state of charge.

If needed, several balancers can be paralleled.

A 48V battery bank can be balanced with three Battery Balancers.

ARGODIODE BATTERY ISOLATORS

Argodiode Isolator 120-2AC

Argodiode Isolator 140-3AC

Diode battery isolators allow simultaneous charging of two or more batteries from one alternator, without connecting the batteries together. Discharging the accessory battery for example will not result in also discharging the starter battery.

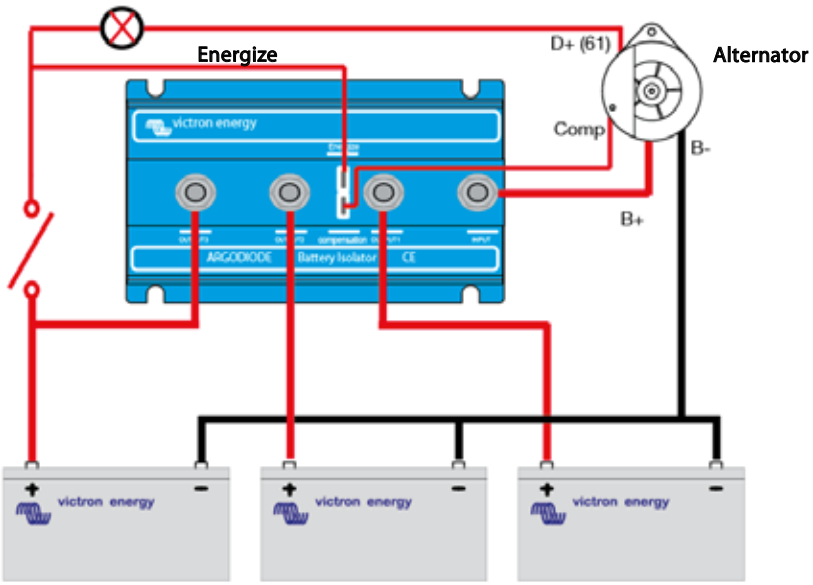
The Argo Battery Isolators feature a low voltage drop thanks to the use of Schottky diodes: at low current the voltage drop is approximately 0,3 V and at the rated output approximately 0,45 V.
All models are fitted with a compensation diode that can be used to slightly increase the output voltage of the alternator. This compensates for the voltage drop over the diodes in the isolator.

Please see our book 'Energy Unlimited' or ask for specialist advice when installing a diode isolator. Simply inserting the isolator in the cabling between the alternator and the batteries will slightly reduce charge voltage. The result can be that batteries are not charged to the full 100% and age prematurely.

Alternator energize input

Some alternators need DC voltage on the B+ output to start charging. Obviously, DC will be present when the alternator is directly connected to a battery. Inserting a Diode or FET splitter will however prevent any return voltage/current from the batteries to the B+, and the alternator will not start.
The new 'AC' diode isolators feature a special current limited energize input that will power the B+ when the engine run/stop switch is closed.

Argodiode Battery Isolator	80-2SC	80-2AC	100-3AC	120-2AC	140-3AC	160-2AC	180-3AC
Maximum charge current (A)	80	80	100	120	140	160	180
Maximum alternator current (A)	80	80	100	120	140	160	180
Number of batteries	2	2	3	2	3	2	3
Nominal battery voltage	12V and 24V	12V and 24V	12V and 24V	12V and 24V	12V and 24V	12V and 24V	12V and 24V
Alternator Energize Input	no	yes	yes	yes	yes	yes	yes
Connection	M6 Studs	M6 Studs	M6 Studs	M8 Studs	M8 Studs	M8 Studs	M8 Studs
Compensation diode and Energize connection	6,3 mm Faston	6,3 mm Faston	6,3 mm Faston	6,3 mm Faston	6,3 mm Faston	6,3 mm Faston	6,3 mm Faston
Weight kg (lbs)	0,5 (1.3)	0,6 (1.3)	0,8 (1.8)	0,8 (1.8)	1,1 (2.5)	1,1 (2.5)	1,5 (3.3)
Dimensions h x w x d in mm (h x w x d in inches)	60 x 120 x 75 (2.4 x 4.7 x 3.0)	60 x 120 x 90 (2.4 x 4.7 x 3.9)	60 x 120 x 115 (2.4 x 4.7 x 4.5)	60 x 120 x 115 (2.4 x 4.7 x 4.5)	60 x 120 x 150 (2.4 x 4.7 x 5.9)	60 x 120 x 150 (2.4 x 4.7 x 5.9)	60 x 120 x 200 (2.4 x 4.7 x 7.9)



ARGOFET BATTERY ISOLATORS

Argofet 100-3
3bat 100A

Similarly to Argodiode Battery Isolators, Argofet Isolators allow simultaneous charging of two or more batteries from one alternator (or a single output battery charger), without connecting the batteries together. Discharging the accessory battery for example will not result in also discharging the starter battery.

In contrast with Diode Battery Isolators, FET Isolators have virtually no voltage loss. Voltage drop is less than 0,02 Volt at low current and averages 0,1 Volt at higher currents.

When using Argofet Battery Isolators, there is no need to also increase the output voltage of the alternator. However, care should be taken to keep cable lengths short and of sufficient cross section.

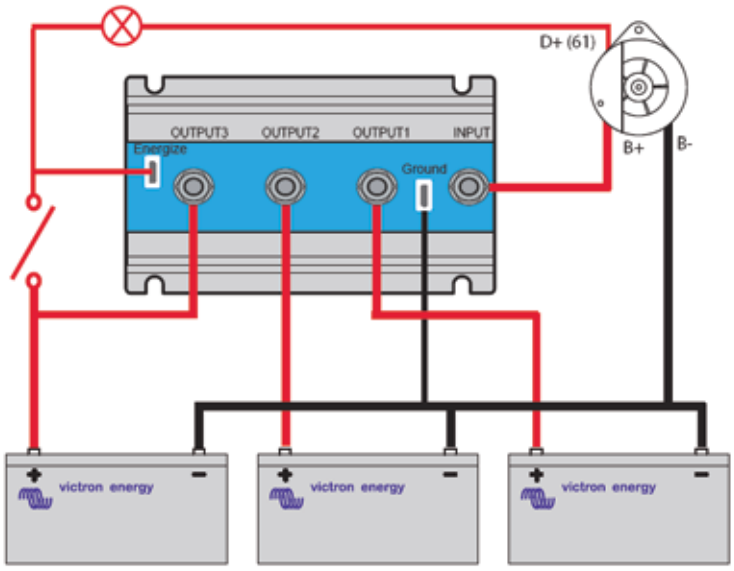
Example:
When a current of 100 A flows through a cable of 50 mm^2 cross section (AWG 0) and 10 m length (30 ft), the voltage drop over the cable will be 0,26 Volt. Similarly a current of 50 A through a cable of 10 mm^2 cross section (AWG 7) and 5 m length (15 ft) will result in a voltage drop of 0,35 Volt!

Alternator energize input

Some alternators need DC voltage on the B+ output to start charging. Obviously, DC will be present when the alternator is directly connected to a battery. Inserting a Argodiode or Argofet splitter will however prevent any return voltage/current from the batteries to the B+, and the alternator will not start.
The new Argofet Isolators have a special current limited energize input that will power the B+ when the engine run/stop switch is closed.

Argofet 100-3
3bat 100A

Argofet Battery Isolator	Argofet 100-2	Argofet 100-3	Argofet 200-2	Argofet 200-3
Maximum charge current (A)	100	100	200	200
Maximum alternator current (A)	100	100	200	200
Number of batteries	2	3	2	3
Nominal battery voltage	12V and 24V	12V and 24V	12V and 24V	12V and 24V
Connection	M8 bolts	M8 bolts	M8 bolts	M8 bolts
Weight kg (lbs)	1,4 (3.1)	1,4 (3.1)	1,4 (3.1)	1,4 (3.1)
Dimensions: h x w x d in mm (h x w x d in inches)	65 x 120 x 200 (2.6 x 4.7 x 7.9)	65 x 120 x 200 (2.6 x 4.7 x 7.9)	65 x 120 x 200 (2.6 x 4.7 x 7.9)	65 x 120 x 200 (2.6 x 4.7 x 7.9)



BATTERY BALANCER

The problem: the service life of an expensive battery bank can be substantially shortened due to state of charge unbalance

One battery with a slightly higher internal leakage current in a 24V or 48V bank of several series/parallel connected batteries will cause undercharge of that battery and parallel connected batteries, and overcharge of the series connected batteries. Moreover, when new cells or batteries are connected in series, they should all have the same initial state of charge. Small differences will be ironed out during absorption or equalize charging, but large differences will result in damage due to excessive gassing (caused by overcharging) of the batteries with the higher initial state of charge and sulphation (caused by undercharging) of the batteries with the lower initial state of charge.

The Solution: battery balancing

The Battery Balancer equalizes the state of charge of two series connected 12V batteries, or of several parallel strings of series connected batteries.
When the charge voltage of a 24V battery system increases to more than 27,3V, the Battery Balancer will turn on and compare the voltage over the two series connected batteries. The Battery Balancer will draw a current of up to 0,7A from the battery (or parallel connected batteries) with the highest voltage. The resulting charge current differential will ensure that all batteries will converge to the same state of charge.

If needed, several balancers can be paralleled.
A 48V battery bank can be balanced with three Battery Balancers.

LED indicators

Green: on (battery voltage > 27,3V)
Orange: lower battery leg active (deviation > 0,1V)
Orange: upper battery leg active (deviation > 0,1V)
Red: alarm (deviation > 0,2V). Remains on until the deviation has reduced to less than 0,14V, or until system voltage drops to less than 26,6V.

Alarm relay

Normally open. The alarm relay closes when the red LED switches on and opens when the red LED switches off.

Alarm reset

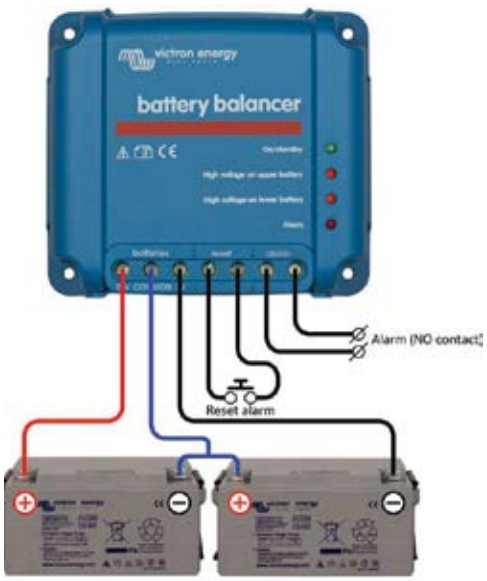
Two terminals are available to connect a push button. Interconnecting the two terminals resets the relay.
The reset condition will remain active until the alarm is over. Thereafter the relay will close again when a new alarm occurs.

Even more insight and control with the midpoint monitoring function of the BMV-702 Battery Monitor

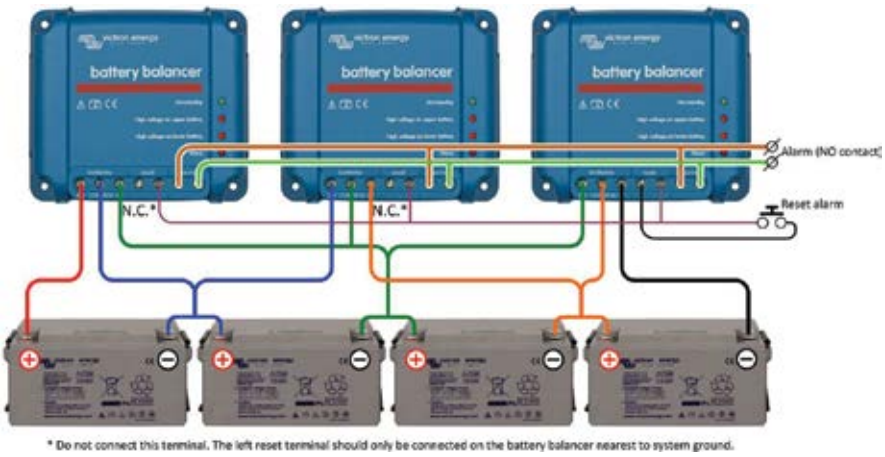
The BMV-702 measures the midpoint of a string of cells or batteries. It displays the deviation from the ideal midpoint in volts or percent. Separate deviation percentages can be set to trigger a visual/audible alarm and to close a potential free relay contact for remote alarm purposes.
Please see the manual of the BMV-702 for more information about battery balancing.

Learn more about batteries and battery charging

To learn more about batteries and charging batteries, please refer to our book 'Energy Unlimited' (available free of charge from Victron Energy and downloadable from www.victronenergy.com).

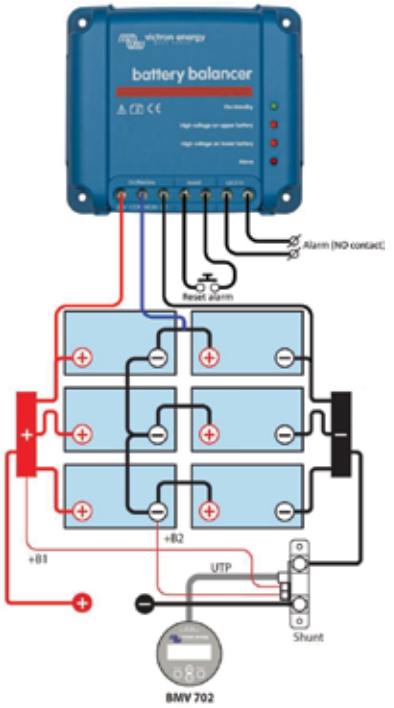


Battery Balancer connected to two series connected 12V batteries (24V system)



Three Battery Balancers connected to four series connected 12V batteries (48V system)

Victron Battery Balancer	
Input voltage range	Up to 18V per battery, 36V total
Turn on level	27,3V +/- 1%
Turn off level	26,6V +/- 1%
Current draw when off	0,7 mA
Midpoint deviation to start balancing	50 mV
Maximum balancing current	0,7A (when deviation > 100 mV)
Alarm trigger level	200 mV
Alarm reset level	140 mV
Alarm relay	60V / 1A normally open
Alarm relay reset	Two terminals to connect a push button
Over temperature protection	yes
Operating temperature	-30 to +50°C
Humidity (non-condensing)	95%
ENCLOSURE	
Colour	Blue (RAL 5012)
Connection terminals	Screw terminals 6 mm² / AWG10
Protection category	IP22
Weight	0,4 kg
Dimensions (h x w x d)	100 x 113 x 47 mm
STANDARDS	
Safety	EN 60950, CSA/UL 62368-1
Emission	EN 61000-6-3, EN 55014-1
Immunity	EN 61000-6-2, EN 61000-6-1, EN 55014-2
Automotive Directive	EN 50498



Battery Balancer connected to six series-parallel connected 12V batteries (24V system)

Installation

1) The Battery Balancer(s) must be installed on a well-ventilated vertical surface close to the batteries (but, due to possible corrosive gasses, not above the batteries!)
2) **In case of series-parallel connection, the midpoint interconnecting cables must be sized to at least carry the current that arises when one battery becomes open-circuited.**
   - In case of 2 parallel strings: cross section 50% of the series interconnecting cables.
   - In case of 3 parallel strings: cross section 33% of the series interconnecting cables, etc.
3) If required: first wire the alarm contact and the alarm reset.
4) Use at least 0,75 mm² to wire the negative, positive and midpoint connections (in this order). Additionally, if in your application it is needed to comply with UL, also fuse these wires near the batteries with a 10A fuse suitable for DC current (e.g. Littelfuse ATOF series automotive blade fuse in combination with an inline fuse holder).
5) The balancer is operational.
   When the voltage over a string of two batteries is less than 26,6V the balancer switches to standby and all LEDs will be off.
   When the voltage over a string of two batteries increases to more than 27,3V (during charging) the green LED will turn on, indicating that the balancer is on.
   When on, a voltage deviation of more than 50 mV will start the balancing process and at 100 mV one of the two orange LEDs will turn on. A deviation of more than 200 mV will trigger the alarm relay.

What to do in case of an alarm during charging

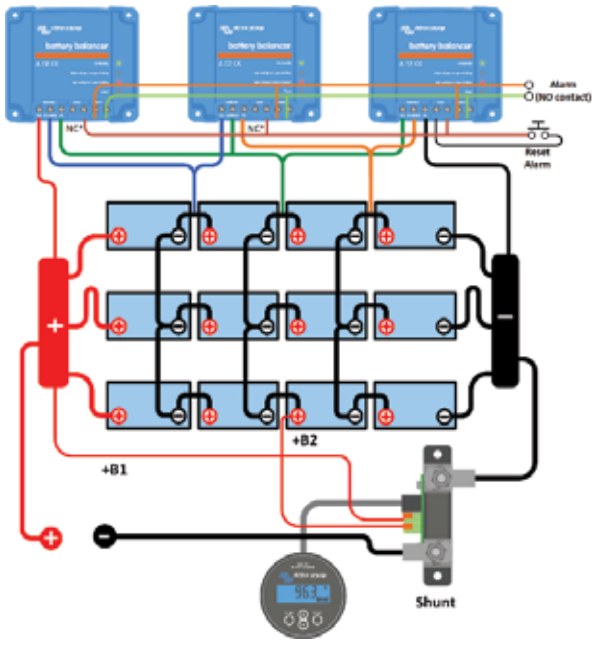
In case of a new battery bank the alarm is probably due to differences in initial state-of-charge. If the difference between the lowest and highest battery voltage reading is more than 0,9V: stop charging and charge the individual batteries or cells separately first, or reduce charge current substantially and allow the batteries to equalize over time.

If the problem persists after several charge-discharge cycles:

a) In case of series-parallel connection disconnect the midpoint parallel connection wiring and measure the individual midpoint voltages during absorption charge to isolate batteries or cells which need additional charging, or:
b) Charge and then test all batteries or cells individually or:
c) Connect two or more battery balancers in parallel (on average one balancer will take care of up to three parallel 200 Ah strings).

In case of an older battery bank which has performed well in the past, the problem may be due to:

d) Systematic undercharge: more frequent charging needed (VRLA batteries), or equalization charge needed (flooded deep cycle flat plate or OPzS batteries). Better and regular charging will solve the problem.
e) One or more faulty cells: replace all batteries.



Three Battery Balancers connected to 12 series-parallel connected 12V batteries (48V system)

EV CHARGING STATION NS – 22 KW

EV Charging Station NS

EV Charging Station NS - Front

Black, blue (default) or white front

VictronConnect app

High power EV Charging Station

The EV Charging Station NS has three-phase and single-phase capabilities. It delivers a maximum of 22 kW AC in three-phase or 7.3 kW in single-phase mode. It comes with a blue front. A black or white front can be purchased separately.

WiFi Communication

WiFi: 802.11 b/g/n for configuration, monitoring and control. The internal WiFi module can be configured in Access Point or Station mode for both, the initial setup and monitoring.

Easy operation and control via Bluetooth and the VictronConnect App

Get full control and overview of all operating parameters and session statistics at a glance.

Light Ring for fast viewing the device state

Fully programmable RGB Light Ring around the charging port to quickly determine the device state. It can be programmed from the integrated web interface to display different light effects based on the current state (disconnected, charging, charged etc.).

Three working modes available:

1. **Manual Mode to configure output current**
   Manual mode allows configurable output current between 6-32 A. The charging power can be regulated in different ways: by using the web interface, from a GX device and VRM and via VictronConnect. It allows to manually start or stop the charging process when a vehicle is connected to the charging station.
2. **Automatic Mode to ensure maximum PV system efficiency**
   Detects when excess power is available and uses only that power to charge the vehicle.
3. **Scheduled Mode to charge the EV at certain time intervals**
   A fully programmable scheduler allows charging at different time intervals, for example at certain times during the night when grid energy is cheaper.

Integration with GX devices and VRM

Control and monitor the EV Charging Station NS from a GX device touch display and the Remote Console and the VRM Portal. The VRM Portal also offers real time and custom reports for configurable time periods.

EV Charging Station NS	EVC200300200
Input voltage range (V AC)	170 – 265 VAC
Rated charge current	32 A / phase
Nominal power	22 kW
Current output range	6 – 32 A
WiFi standards	802.11 b/g/n (2.4 Ghz only)
Self-consumption	15 mA@230 V
Configurable Max. Current	6 - 32 A
Configurable Min. Current	6 – 32 A
Connector type	IEC 62196 Type 2
GENERAL	
Means to Disconnect	External circuit breaker (40 A recommended)
Configurable price/kWh calculator(Eur)	Default setting: 0.13 (adjustable)
Control type	Web page, GX Device over Modbus TCP, VictronConnect via Bluetooth
Light Ring	55 light configurable light effects available
Protection	External RCD is required
Operating temperature	-25 °C to +50 °C
Storage temperature	-40 °C to +80 °C
Humidity	95 %, non-condensing
Data communication	Modbus TCP over WiFi, Bluetooth
ENCLOSURE	
Enclosure colour	Light Blue (RAL 5012), Traffic Black (RAL 9017), Traffic White (RAL 9016)
Power terminals	6-10 mm^2 / AWG 10-8
Protection category	IP44
Ventilation	not required
Weight	3 kg
Dimensions (h x w x d)	372 x 292 x 122mm
STANDARDS	
Safety	IEC 61851-1, IEC 61851-22 Detection for Relay Contact welded Detection for missing protective conductor Detection for missing Ground Detection for shorted CP

GEL AND AGM BATTERIES

AGM Battery
12V 90Ah

1. VRLA technology

VRLA stands for Valve Regulated Lead Acid, which means that the batteries are sealed. Gas will escape through the safety valves only in case of overcharging or cell failure.
VRLA batteries are maintenance free for life.

2. Sealed (VRLA) AGM Batteries

AGM stands for Absorbent Glass Mat. In these batteries the electrolyte is absorbed into a glass-fibre mat between the plates by capillary action. As explained in our book 'Energy Unlimited', AGM batteries are more suitable for short-time delivery of high currents than gel batteries.

3. Sealed (VRLA) Gel Batteries

Here the electrolyte is immobilized as gel. Gel batteries in general have a longer service life and better cycle capacity than AGM batteries.

4. Low Self-Discharge

Because of the use of lead calcium grids and high purity materials, Victron VRLA batteries can be stored during long periods of time without recharge. The rate of self-discharge is less than 2% per month at 20°C. The self-discharge doubles for every increase in temperature by 10°C.
Victron VRLA batteries can therefore be stored for up to a year without recharging, if kept under cool conditions.

5. Exceptional Deep Discharge Recovery

Victron VRLA batteries have exceptional discharge recovery, even after deep or prolonged discharge.
Nevertheless repeatedly deep and prolonged discharge has a very negative effect on the service life of all lead acid batteries, Victron batteries are no exception.

6. Battery Discharging Characteristics

The rated capacity of Victron AGM and Gel Deep Cycle batteries refers to 20 hour discharge, in other words: a discharge current of 0,05 C.
The rated capacity of Victron Tubular Plate Long Life batteries refers to 10 hours discharge.
The effective capacity decreases with increasing discharge current (see table 1). Please note that the capacity reduction will be even faster in case of a constant power load, such as an inverter.

Discharg time (constant current)	End Voltage V	AGM 'Deep Cycle' %	Gel 'Deep Cycle' %	Gel 'Long Life' %
20 hours	10,8	100	100	112
10 hours	10,8	92	87	100
5 hours	10,8	85	80	94
3 hours	10,8	78	73	79
1 hour	9,6	65	61	63
30 min.	9,6	55	51	45
15 min.	9,6	42	38	29
10 min.	9,6	38	34	21
5 min.	9,6	27	24	
5 seconds		8 C	7 C	

Table 1: Effective capacity as a function of discharge time
(the lowest row gives the maximum allowable 5 seconds discharge current)

Our AGM deep cycle batteries have excellent high current performance and are therefore recommended for high current applications such as engine starting. Due to their construction, Gel batteries have a lower effective capacity at high discharge currents. On the other hand, Gel batteries have a longer service life, both under float and cycling conditions.

7. Effect of temperature on service life

High temperature has a very negative effect on service life. The service life of Victron batteries as a function of temperature is shown in table 2.

Average Temperature	AGM 'Deep Cycle' years	Gel 'Deep Cycle' years	Gel 'Long Life' years
20°C / 68°F	7 - 10	12	20
30°C / 86°F	4	6	10
40°C / 104°F	2	3	5

Table 2: Design service life of Victron batteries under float service

8. Effect of temperature on capacity

As is shown by the graph below, capacity reduces sharply at low temperatures.

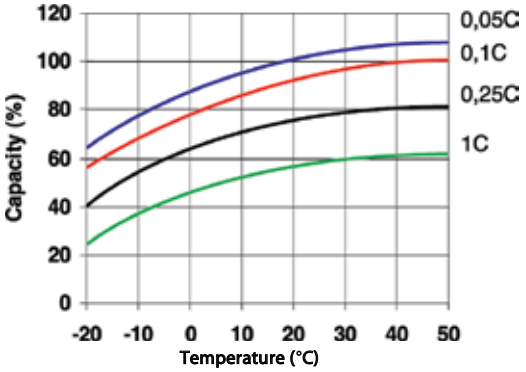


Fig. 1: Effect of temperature on capacity

9. Cycle life of Victron batteries

Batteries age due to discharging and recharging. The number of cycles depends on the depth of discharge, as is shown in figure 2.

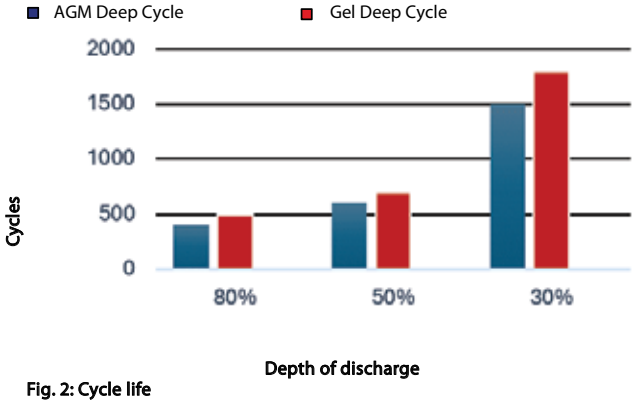


Fig. 2: Cycle life

10. Battery charging in case of cycle use: the 3-step charge curve

The most common charge curve used to charge VRLA batteries in case of cyclic use is the 3-step charge curve, whereby a constant current phase (the bulk phase) is followed by two constant voltage phases (absorption and float), see fig. 3.

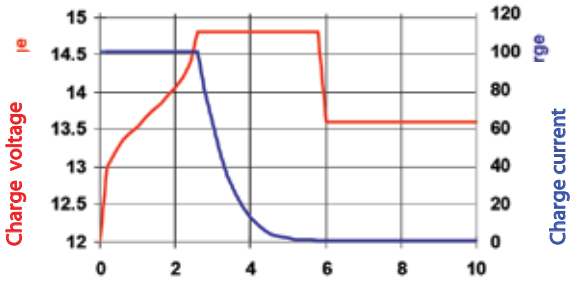


Fig. 3: Three step charge curve

During the absorption phase the charge voltage is kept at a relatively high level in order to fully recharge the battery within reasonable time. The third and last phase is the float phase: the voltage is lowered to standby level, sufficient to compensate for self-discharge.

Disadvantages of the traditional 3-step charge curve:

- During the bulk phase the current is kept at a constant and often high level, even after the gassing voltage (14,34V for a 12V battery) has been exceeded. This can lead to excessive gas pressure in the battery. Some gas will escape through the safety valves, reducing service life.
- Thereafter the absorption voltage is applied during a fixed period of time, irrespective of how deep the battery has been discharged previously. A full absorption period after a shallow discharge will overcharge the battery, again reducing service life (a.o. due to accelerated corrosion of the positive plates).
- Research has shown that battery life can be increased by decreasing float voltage to an even lower level when the battery is not in use.

11. Battery charging: longer battery life with Victron 4-step adaptive charging

Victron developed the adaptive charge curve. The 4-step adaptive chare curve is the result of years of research and testing.

The Victron four-step adaptive charge curve solves the 3 main problems of the 3-step curve:

- Battery Safe Mode
  In order to prevent excessive gassing, Victron has invented the 'Battery Safe Mode'. The Battery Safe Mode will limit the rate of voltage increase once the gassing voltage has been reached. Research has shown that this will reduce internal gassing to a safe level.
- Variable absorption time
  Based on the duration of the bulk stage, the charger calculates how long the absorption time should be in order to fully charge the battery. If the bulk time is short, this means the battery was already charged and the resulting absorption time will also be short, whereas a longer bulk time will also result in a longer absorption time.
- Storage mode
  After completion of the absorption period the battery should be fully charged, and the voltage is lowered to the float or standby level. If no discharge occurs during the next 24 hours, the voltage is reduced even further and the battery goes into storage mode. The lower storage voltage reduces corrosion of the positive plates.
  Once every week the charge voltage is increased to the absorption level for a short period to compensate for self-discharge (Battery Refresh mode).

12. Battery charging in case of standby use: constant voltage float charging

When a battery is not frequently deeply discharged, a 2-step charge curve can be used. During the first phase the battery is charged with a limited current (the bulk phase). Once a pre-set voltage has been reached the battery is kept at that voltage (the float phase).
This charge method is used for starter batteries in vehicles and in uninterruptible power supplies (UPS).

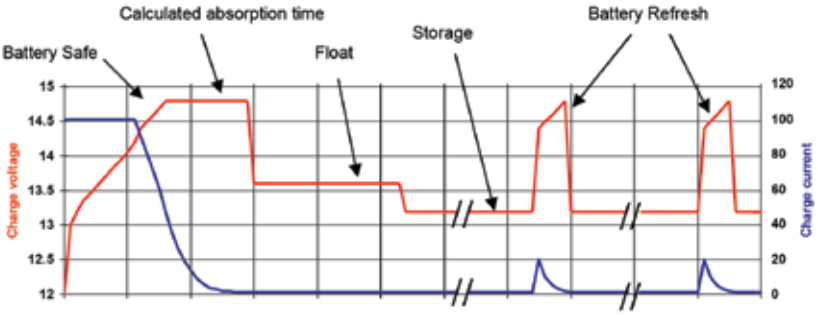


Fig. 4: Four-step adaptive charge curve

13. Optimum charge voltage of Victron VRLA batteries

The recommended charge voltage settings for a 12V battery are shown in table 3.

14. Effect of temperature on charging voltage

The charge voltage should be reduced with increased temperature. Temperature compensation is required when the temperature of the battery is expected to be less than 10°C / 50°F or more than 30°C / 85°F during long periods of time.
The recommended temperature compensation for Victron VRLA batteries is -4 mV / Cell (-24 mV /°C for a 12V battery).
The centre point for temperature compensation is 25°C / 70°F.

15. Charge current

The charge current should preferably not exceed 0,2C (20A for a 100Ah battery).The temperature of a battery will increase by more than 10°C if the charge current exceeds 0,2C. Therefore temperature compensation is required if the charge current exceeds 0,2C.

	Float Service (V)	Cycle service Normal (V)	Cycle service Fastest recharge (V)
Victron AGM 'Deep Cycle'			
Absorption		14,2 - 14,6	14,6 - 14,9
Float	13,5 - 13,8	13,5 - 13,8	13,5 - 13,8
Storage	13,2 - 13,5	13,2 - 13,5	13,2 - 13,5
Victron Gel 'Deep Cycle'			
Absorption		14,1 - 14,4	
Float	13,5 - 13,8	13,5 - 13,8	
Storage	13,2 - 13,5	13,2 - 13,5	

Table 3: Recommended charge voltage

12 Volt Deep Cycle AGM							General Specification
Article number	Ah	V	l x w x h mm	Weight kg	CCA @0°F	RES CAP @80°F	Technology: flat plate AGM Terminals: copper
BAT406225084	**240**	6	320 x 176 x 247	31	700	270	Rated capacity: 20 hr. discharge at 25°C Float design life: 7-10 years at 20°C Cycle design life: 400 cycles at 80% discharge 600 cycles at 50% discharge 1500 cycles at 30% discharge
BAT212070084	**8**	12	151 x 65 x 101	2,5			
BAT212120086	**14**	12	151 x 98 x 101	4,4			
BAT212200084	**22**	12	181 x 77 x 167	5,8			
BAT412350084	**38**	12	197 x 165 x 170	12,5			
BAT412550084	**60**	12	229 x 138 x 227	20	280	80	
BAT412800084	**90**	12	350 x 167 x 183	27	400	130	
BAT412101084	**110**	12	330 x 171 x 220	32	500	170	
BAT412121084	**130**	12	410 x 176 x 227	38	550	200	
BAT412151084	**165**	12	485 x 172 x 240	47	600	220	
BAT412201084	**220**	12	522 x 238 x 240	65	650	250	
BAT412124081	**240**	12	522 x 240 x 224	67	650	250	

12 Volt Deep Cycle GEL							General Specification
Article number	Ah	V	l x w x h mm	Weight kg	CCA @0°F	RES CAP @80°F	Technology: flat plate GEL Terminals: copper
BAT412550104	**60**	12	229 x 138 x 227	20	250	70	Rated capacity: 20 hr. discharge at 25°C Float design life: 12 years at 20°C Cycle design life: 500 cycles at 80% discharge 750 cycles at 50% discharge 1800 cycles at 30% discharge
BAT412800104	**90**	12	350 x 167 x 183	26	360	120	
BAT412101104	**110**	12	330 x 171 x 220	33	450	150	
BAT412121104	**130**	12	410 x 176 x 227	38	500	180	
BAT412151104	**165**	12	485 x 172 x 240	48	550	200	
BAT412201104	**220**	12	522 x 238 x 240	66	600	220	
BAT412126101	**265**	12	520 x 268 x 223	75	650	250	

Other capacities and terminal types: at request

12,8 & 25,6 VOLT LITHIUM-IRON-PHOSPHATE BATTERIES SMART: WITH BLUETOOTH

12,8 V 330 Ah LiFePO4 Battery

VictronConnect App

Victron Energy Lithium Battery Smart batteries are Lithium Iron Phosphate (LiFePO4) batteries and are available in 12.8 V or 25.6 V in various capacities. They can be connected in series, parallel and series/parallel so that a battery bank can be built for system voltages of 12 V, 24 V or 48 V. The maximum number of batteries in one system is 20, which results in a maximum energy storage of 84 kWh in a 12 V system and up to 102 kWh in a 24 V[1] and 48 V[1] system.

A single LFP cell has a nominal voltage of 3.2 V. A 12.8 V battery consists of 4 cells connected in series and a 25.6 V battery consists of 8 cells connected in series.

Why lithium-iron-phosphate?

Rugged

A lead-acid battery will fail prematurely due to sulfation:

- If it operates in deficit mode during long periods of time (i.e. if the battery is rarely, or never at all, fully charged).
- If it is left partially charged or worse, fully discharged (yacht or mobile home during wintertime).

A LFP battery:

- Does not need to be fully charged. Service life even slightly improves in case of partial charge instead of a full charge. This is a major advantage of LFP compared to lead-acid.
- Other advantages are the wide operating temperature range, excellent cycling performance, low internal resistance and high efficiency (see below).

LFP is therefore the chemistry of choice for demanding applications.

Efficient

- In several applications (especially off-grid solar and/or wind), energy efficiency can be of crucial importance.
- The round-trip energy efficiency (discharge from 100 % to 0 % and back to 100 % charged) of the average lead-acid battery is 80 %.
- The round-trip energy efficiency of a LFP battery is 92 %.
- The charge process of lead-acid batteries becomes particularly inefficient when the 80 % state of charge has been reached, resulting in efficiencies of 50 % or even less in solar systems where several days of reserve energy is required (battery operating in 70 % to 100 % charged state).
- In contrast, a LFP battery will still achieve 90 % efficiency under shallow discharge conditions.

Size and weight

- Saves up to 70 % in space
- Saves up to 70 % in weight

Expensive?

- LFP batteries are expensive when compared to lead-acid. But in demanding applications, the high initial cost will be more than compensated by longer service life, superior reliability and excellent efficiency.

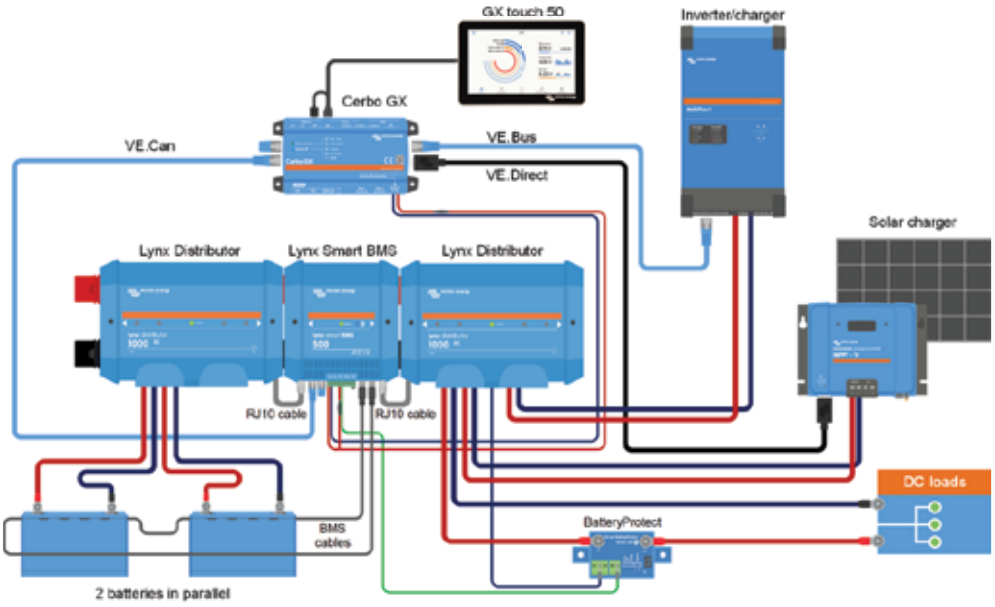
Bluetooth

- With Bluetooth cell voltages, temperature and alarm status can be monitored.
- Instant readout: The VictronConnect App can display the most important data on the Device list page without the need to connect to the product.
- Very useful to localize a (potential) problem, such as cell imbalance.

Six tailored BMS solutions

- There are 6 different BMS models tailored for various applications available for use with the Lithium Battery Smart. The system design and BMS selection guide in the battery manual provides an overview and explains the differences between them and their typical use.

[1] To reduce required balancing time, we recommend using a little different batteries in series as possible for the application. 24 V systems are best built using 24 V batteries. And 48 V systems are best built using two 24 V batteries in series. While the alternative, four 12 V batteries in series, will work, it will require more periodic balancing time.



Our LFP batteries have integrated cell balancing and cell monitoring. The cell balancing/monitoring cables can be daisy-chained and must be connected to a Battery Management System (BMS).

Battery Management System (BMS)

The BMS will:

1. Generate a pre-alarm whenever the voltage of a battery cell decreases to less than 3.1 V (adjustable 2.85 V – 3.15 V).
2. Disconnect or shut down the load whenever the voltage of a battery cell decreases to less than 2.8 V (adjustable 2.6 V – 2.8 V).
3. Stop the charging process whenever the voltage of a battery cell increases to more than 3.75 V or when the temperature becomes too high or too low.

See the BMS datasheets for more features.

Battery specification

VOLTAGE AND CAPACITY	LFP-Smart 12,8/50	LFP-Smart 12,8/100	LFP-Smart 12,8/160	LFP-Smart 12,8/180	LFP-Smart 12,8/200	LFP- Smart 12,8/330	LFP- Smart 25,6/100	LFP-Smart 25,6/200-a
Nominal voltage	12,8 V	12,8 V	12,8 V	12,8 V	12,8 V	12,8 V	25,6 V	25,6 V
Nominal capacity @ 25 °C*	50 Ah	100 Ah	160 Ah	180 Ah	200 Ah	330 Ah	100 Ah	200 Ah
Nominal capacity @ 0 °C*	40 Ah	80 Ah	130 Ah	150 Ah	160 Ah	260 Ah	80 Ah	160 Ah
Nominal capacity @ -20 °C*	25 Ah	50 Ah	80 Ah	90 Ah	100 Ah	160 Ah	50 Ah	100 Ah
Nominal energy @ 25 °C*	640 Wh	1280 Wh	2048 Wh	2304 Wh	2560 Wh	4220 Wh	2560 Wh	5120 Wh
Capacity loss	(per 100 cycles, @ 25 °C, 100 % DoD): <1 %							
Energy loss	(per 100 cycles, @ 25 °C, 100 % DoD): <1 %							
Round trip efficiency	92 %							
*Discharge current ≤1C								
CYCLE LIFE (capacity ≥ 80 % of nominal)								
80 % DoD	2500 cycles							
70 % DoD	3000 cycles							
50 % DoD	5000 cycles							
DISCHARGE								
Maximum continuous discharge current	100 A	200 A	320 A	360 A	400 A	400 A	200 A	400 A
Recommended continuous discharge current	≤50 A	≤100 A	≤160 A	≤180 A	≤200 A	≤300 A	≤100 A	≤200 A
End of discharge voltage	11.2 V	11.2 V	11.2 V	11.2 V	11.2 V	11.2 V	22.4 V	22.4 V
Internal resistance	2 mΩ	0.8 mΩ	0.9 mΩ	0.9 mΩ	0.8 mΩ	0.8 mΩ	1.6 mΩ	1.5 mΩ
OPERATING CONDITIONS								
Operating temperature	Discharge: -20 °C to +50 °C Charge: +5 °C to +50 °C							
Storage temperature	-45 °C to +70 °C							
Humidity (non-condensing)	Max. 95 %							
Protection class	IP 22							
CHARGE								
Charge voltage	Between 14 V/28 V and 14,4 V/28,8 V (14,2 V/28,4 V recommended)							
Float voltage	13,5 V/27 V							
Maximum charge current	100 A	200 A	320 A	360 A	400 A	400 A	200 A	400 A
Recommended charge current	≤30 A	≤50 A	≤80 A	≤90 A	≤100 A	≤150 A	≤50 A	≤100 A
MOUNTING								
Can be placed on their sides	Yes[2]	Yes[2]	Yes[2]	Yes[2]	Yes[2]	No[3]	Yes[2]	Yes[2]
OTHER								
Max storage time @ 25°C[1]	1 year							
BMS connection	Male + female cable with M8 circular connector, length 50 cm							
Max batteries per BMS	20 (102 kWh per BMS[4])							
Power connection (threaded inserts)	M8	M8	M8	M8	M8	M10	M8	M8
Dimensions (hxwxd) mm	199 x 188 x 147	197 x 321 x 152	237 x 321 x 152	237 x 321 x 152	237 x 321 x 152	265 x 359 x 206	197 x 650 x 163	237 x 650 x 163
Weight	7 kg	14 kg	18 kg	18 kg	20 kg	29 kg	28 kg	39 kg
STANDARDS								
Safety	Cells: UL1973 + IEC62619:2017 + UL9540A		Cells: IEC62133:2012		Cells: UL1973 + IEC62619:2017 + UL9540A Battery: IEC62619:2017 + IEC62620:2014	Cells: UL1642	Cells: UL1973 + UL9540A	Cells: UL1973 + IEC62619:2017 + UL9540A Battery: IEC62620:2014
	EN 60335-1:2012/AC:2014, EN-IEC 62368-1: 2020, IEC 61427-1:2013							
EMC	EN-IEC 61000-6-3:2007/A1:2011/AC:2012 - EN 55014-1:2017/A11:2020							
Automotive	ECE R10-6							

[1] When fully charged
[2] The lithium battery can be mounted upright and on its side, but not with the battery terminals facing down
[3] The 12,8V/330Ah lithium battery may only be mounted in an upright position
[4] Up to 5 BMS-es can be paralleled. For more info, please see the official release notes

12,8V & 25,6V LITHIUM SUPERPACK BATTERIES

Integrated BMS and safety switch

The SuperPack batteries are extremely easy to install, needing no additional components.
The internal switch will disconnect the battery in case of over discharge, over charge, low or high temperature.

Abuse proof

A lead-acid battery will fail prematurely due to sulfation:

- If it operates in deficit mode during long periods of time (i.e. if the battery is rarely, or never at all, fully charged).
- If it is left partially charged or worse, fully discharged.

A Lithium-Ion battery does not need to be fully charged. Service life even slightly improves in case of partial charge instead of a full charge. This is a major advantage of Li-ion compared to lead-acid.

The SuperPack batteries will cut-off the charge or discharge current when the maximum ratings are exceeded.

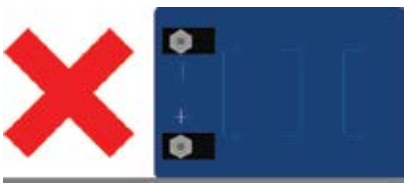
Efficient

In several applications (especially off-grid solar), energy efficiency can be of crucial importance.
The round-trip energy efficiency (discharge from 100 % to 0 % and back to 100 % charged) of the average lead-acid battery is 80 % .
The round-trip energy efficiency of a Li-ion battery is 92 % .
The charge process of lead-acid batteries becomes particularly inefficient when the 80 % state of charge has been reached, resulting in efficiencies of 50 % or even less in solar systems where several days of reserve energy are required (battery operating in 70 % to 100 % charged state).
In contrast, a Li-ion battery will still achieve 90 % efficiency even under shallow discharge conditions.

Can be connected in parallel

The batteries can be connected in parallel. Series connection is not allowed.
Use in allowed positions only.

Every battery [4]



12,8/200 (BAT512120705) [5]

Lithium SuperPack	12,8/20	12,8/60	12,8/100	12,8/200	25,6/50
Chemistry	LiFePO4				
Nominal voltage	12,8 V				25,6 V
Nominal capacity @ 25 °C	20 Ah	60 Ah	100 Ah	200 Ah	50 Ah
Nominal capacity @ 0 °C	16 Ah	48 Ah	80 Ah	160 Ah	40 Ah
Nominal energy @ 25 °C	256 Wh	768 Wh	1280 Wh	2560 Wh	1280 Wh
Cycle life @ 80 % DoD and 25 °C	2500 cycles				
Capacity loss	(per 100 cycles, @ 25 °C, 100 % DoD): <1 %				
Energy loss	(per 100 cycles, @ 25 °C, 100 % DoD): <1 %				
Round trip efficiency	92 %				
CHARGE and DISCHARGE					
Max. cont. discharge current [1]	30 A	30 A	100 A	70 A	50 A
Peak discharge current (10 sec)	80 A	80 A	150 A	100 A	100 A
End of discharge voltage	10 V				20 V
Charge voltage, absorption [2]	14,2 V – 14,4 V				28,4 V – 28,8 V
Charge voltage, float	13,5 V				27 V
Max. cont. charge current	15 A	30 A	100 A	70 A	50 A
OPERATING CONDITIONS					
Parallel configuration	Yes, unlimited				
Series configuration	No				
Operating temperature	Discharge: -20 °C to +50 °C Charge: +0 °C to +45 °C [3]				
Storage temperature	-40 °C to +65 °C				
Max. storage time when fully charged	1 year ≤ 25 °C 3 months ≤ 40 °C				
Humidity (non-condensing)	Max. 95 %				
Protection class	IP 43				
MOUNTING					
Can be placed on its longest side	Yes [4,5]	Yes [4]	Yes [4]	Yes [4,5]	Yes [4]
OTHER					
Power connection (threaded inserts)	M5	M6	M8	M8	M8
Dimensions (h x w x d) mm	167 x 181 x 77	213 x 229 x 138	220 x 330 x 172	208 x 520 x 269	220 x 330 x 172
Weight	3,5 kg	9,5 kg	14 kg	21 kg	14 kg

1. The battery may disconnect when a load with a high input capacitance is connected, such as an inverter. The battery will however retry and connect after approximately 10 seconds.
2. The absorption period should preferably not exceed 4 hrs. A longer absorption period may slightly reduce service life.
3. For serial number HQ2040 and newer the charge is automatically blocked when the cell temperature decreases below 0±3 °C. It will accept charging again when the temperature is above 3±3 °C. Discharge is automatically blocked when cell temperature decreases below -20±3 °C. This protection resets when temperature is above -15±3 °C.
4. The battery can be mounted upright and, on its longest sides, (assuming the exceptions in [5] and [5]), but not with both battery terminals facing down.
5. Do not lay the battery on its long side where the positive terminal (+) is at the bottom, see the image on the left.

12,8, 25,6 & 51,2 VOLT LITHIUM NG BATTERIES

25,6 V 200 Ah Lithium NG battery

Secured with mounting brackets

Lynx Smart BMS NG 500 A & 1000 A

Complete overview of all battery data via VictronConnect (or a GX device and VRM)

Victron Energy Lithium NG batteries are Lithium Iron Phosphate ($LiFePO_4$ or LFP) batteries available in various capacities with nominal voltages of 12.8 V, 25.6 V and 51.2 V. They can be connected in series, parallel, or a combination of both to create battery banks for system voltages of 12V, 24V, or 48V. A maximum of 50 batteries can be used when configuring a bank with 12V or 24V batteries, while up to 25 batteries can be used with 48V batteries. This allows for a maximum energy storage capacity of 192 kWh with 12V batteries, up to 384 kWh with 24V batteries, and 128 kWh with 48V batteries.

Key features:

Integrated shunt

The battery data (battery voltage, current and temperature) are transmitted to the BMS and evaluated there, i.e. to calculate the state of charge, which can then be read out via VictronConnect or a GX communication centre, or to create and issue specific warnings and alarms.

Automatic setup, monitoring and control via VictronConnect App or a GX device and the VRM Portal

All battery parameters are managed by the BMS automatically. The BMS automatically detects the system voltage and the number of batteries in parallel, series and series/parallel connection. The BMS (from now on Lynx Smart BMS NG 500 A/1000 A, further models to follow) is mandatory and must be purchased separately.

Monitoring and control take place via VictronConnect (every BMS model has Bluetooth), a GX communication centre or the VRM Portal. You can view battery parameters such as cell status, cell voltages, battery current and temperatures in real-time. The battery firmware is automatically updated by the BMS.

Easy bracket mounting

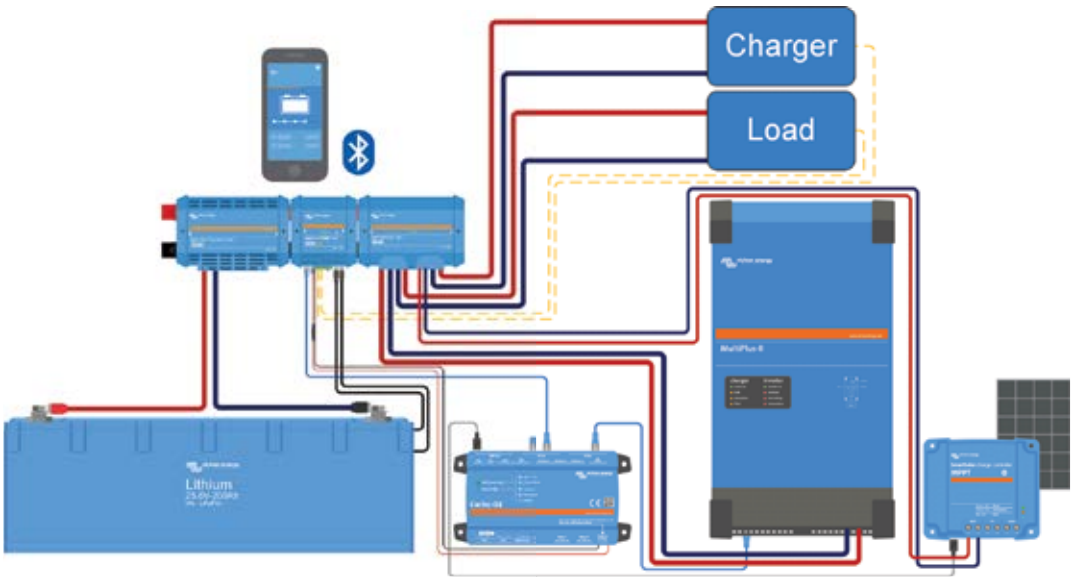
Mounting brackets make the installation easier and ensure that the battery is optimally secured against slipping and tipping over.

Increased ingress protection (IP-rating)

The Lithium NG batteries are effectively sealed against dust and can withstand low-pressure water jets, making them suitable for environments where exposure to dust and water is a concern.

Low self-discharge rate

The self-discharge rate has been significantly improved and is now a maximum of 2 % of the battery capacity per month. A low self-discharge rate contributes to the overall performance, longevity, and reliability of the NG batteries.



Typical system example with Lithium NG battery and Lynx Smart BMS NG

Our Lithium NG batteries have integrated cell balancing and cell monitoring. The cell balancing/monitoring cables can be daisy-chained and must be connected to a Battery Management System (BMS).

Battery Management System (BMS)

The BMS will:

1. Generate a pre-alarm whenever the voltage of a battery cell decreases to less than 3.0 V.
2. Disconnect or shut down the load whenever the voltage of a battery cell decreases to less than 2.8 V.
3. Stop the charging process whenever the voltage of a battery cell increases to more than 3.6 V or when the temperature becomes too high or too low.

See the BMS datasheets for more features.

Battery specification								
VOLTAGE AND CAPACITY	LFP-12,8/100	LFP-12,8/150	LFP-12,8/200	LFP-12,8/300	LFP-25,6/100	LFP-25,6/200	LFP-25,6/300	LFP-51,2/100
Nominal voltage	12,8 V	12,8 V	12,8 V	12,8 V	25,6 V	25,6 V	25,6 V	51,2 V
Nominal capacity @ 25 °C*	100 Ah	150 Ah	200 Ah	300 Ah	100 Ah	200 Ah	300 Ah	100 Ah
Nominal energy @ 25 °C*	1280 Wh	1920 Wh	2560 Wh	3840 Wh	2560 Wh	5120 Wh	7680 Wh	5120 Wh
Capacity loss	(per 100 cycles, @ 25 °C, 100 % DoD): <1 %							
Energy loss	(per 100 cycles, @ 25 °C, 100 % DoD): <1 %							
Round trip efficiency	92 %							
*Discharge current ≤1C								
CYCLE LIFE (capacity ≥ 80 % of nominal)								
80 % DoD	2500 cycles							
70 % DoD	3000 cycles							
50 % DoD	5000 cycles							
DISCHARGE								
Max continuous discharge current (C-rate)	100 A (1C)	150 A (1C)	200 A (1C)	300 A (1C)	100 A (1C)	200 A (1C)	300 A (1C)	100 A (1C)
Max pulse discharge current 10s (C-rate)	200 A (2C)	300 A (2C)	400 A (2C)	600 A (2C)	200 A (2C)	400 A (2C)	600 A (2C)	200 A (2C)
End of discharge voltage	11,2 V				22,4 V			44,8 V
Internal resistance	2 mΩ		1 mΩ		4 mΩ	2 mΩ	1 mΩ	8 mΩ
CHARGE								
Charge voltage	Between 14 V / 28 V / 56 V and 14,4 V / 28,8 V / 56,8 V							
Float voltage	13,5 V / 27 V 54 V							
Max continuous charge current (C-rate)	100 A (1C)	150 A (1C)	200 A (1C)	300 A (1C)	100 A (1C)	200 A (1C)	300 A (1C)	100 A (1C)
Max pulse charge current 10s (C-rate)	200 A (2C)	225 A (1.5C)	400 A (2C)	450 A (1.5C)	200 A (2C)	400 A (2C)	450 A (1.5C)	200 A (2C)
GENERAL								
BMS-es	Lynx Smart BMS NG 500 A / 1000 A (M10 busbars), must be purchased separately							
Cell measurements	Cell voltages and temperatures, battery current							
Battery BMS interface	Male + female cable with M8 circular connector with high-speed digital communication, length 50 cm M8 extension cables are available separately for purchase in various lengths between 1 and 5 meters							
Alarm feature	Pre-alarm contact on BMS							
Bluetooth	In the BMS							
Max batteries per BMS	50 (up to 384 kWh per BMS [3])							25 (128 kWh per BMS [3])
Battery firmware updates	Battery firmware automatically updated by BMS							
Repairable	Yes (cover can be removed with screws)							
OPERATING CONDITIONS								
Operating temperature	Discharge: -20 °C to +50 °C | Charge: +5 °C to +50 °C							
Storage temperature	-45 °C to +70 °C							
Humidity (non-condensing)	Max. 95 %							
Protection class	IP65							
MOUNTING								
Mounting options	Strap or mounting brackets (brackets included)							
Can be placed on their sides	Yes[2]							
OTHER								
Self-discharge rate	≤ 3 % per month @ 25 °C							
Power connection	M8 (threaded inserts and bolts)							
Dimensions (h x w x d) mm	235 x 197 x 160	205 x 250 x 205	235 x 341 x 160	206 x 447 x 205	235 x 341 x 160	235 x 648 x 162	206 x 841 x 205	235 x 648 x 162
Weight (est.)	9 kg	14 kg	19 kg	29 kg	19 kg	37 kg	52 kg	37 kg
STANDARDS								
Safety	Cells: UL1973 UL9540A IEC62619	Cells: UL1973 UL9540A IEC62619 (all three pending)	Cells: UL1973 UL9540A IEC62619	Cells: UL1973 UL9540A IEC62619 (all three pending)	Cells: UL1973 UL9540A IEC62619	Cells: UL1973 UL9540A IEC62619	Cells: UL1973 UL9540A IEC62619(all three pending)	Cells: UL1973 UL9540A IEC62619 (all three pending)
	Battery: IEC 62619 (pending)							
EMC	EN 61000-6-3, EN 61000-6-2							
Automotive	ECE R10-6 (pending)							
Performance	IEC 62620 (pending)							

[1] When fully charged
[2] The lithium battery can be mounted upright and on its side, but not with the battery terminals facing down
[3] Up to 5 BMS-es can be paralleled. For more info, please see this announcement.

TELECOM BATTERIES

Telecom Battery
Battery AGM 12V 200Ah

Telecom Battery
Battery AGM 12V 200Ah

Designed for telecom applications; excellent 'floor space savers' for marine and vehicle applications

The deep cycle AGM telecom series has been designed for use in telecom systems. With front access terminals and small footprint, the batteries are ideal for racked systems. Similarly, these batteries can help solve limited floor space and access problems on board boats and vehicles.

AGM technology

AGM stands for Absorbent Glass Mat. In these batteries the electrolyte is absorbed into a glass-fibre mat between the plates by capillary action.

Low self-discharge

Because of the use of lead calcium grids and high purity materials, Victron VRLA batteries can be stored during long periods of time without recharge. The rate of self-discharge is less than 2% per month at 20°C. The self-discharge doubles for every increase in temperature by 10°C.

Low internal resistance

Accepts very high charge and discharge rates.

High cyclic life capability

More than 500 cycles at 50% depth of discharge.

Learn more about batteries and battery charging

To learn more about batteries and charging batteries, please refer to our book 'Energy Unlimited' (available free of charge from Victron Energy and downloadable from www.victronenergy.com).

12V AGM Telecom battery	115Ah	165Ah	200Ah
Capacity 1 / 3 / 5 / 10 / 20 hours (% of nominal)	60 / 75 / 82 / 91 / 100 (@ 70°F/25°C, end of discharge 10,5V)		
Capacity 10 / 20 / 30 / 40 minutes (% of nominal)	33 / 44 / 53 / 57 (@ 70°F/25°C, end of discharge 9,6V)		
Nominal capacity (77°F/25°C, 10,5V)	115Ah	165Ah	200Ah
Cold Cranking Amps @ 0°F/-18°C	1000	1500	1800
DIN cold start current (A) @ 0°F/-18°C	600	900	1000
Short Circuit Current (A)	3500	5000	6000
Reserve Capacity (minutes)	200	320	400
Shelf life @ 70°F/20°C	1 year		
Absorption voltage (V) @ 70°F/20°C	14,4 – 14,7		
Float voltage (V) @ 70°F/20°C	13,6 – 13,8		
Storage voltage (V) @ 70°F/20°C	13,2		
Float design life @ 70°F/20°C	12 years		
Cycle design life @ 80% discharge	500		
Cycle design life @ 50% discharge	750		
Cycle design life @ 30% discharge	1800		
Dimensions (lxwxh, mm)	395 x 110 x 293mm	548 x 105 x 316mm	546 x 125 x 323mm
Dimensions (lxwxh, inches)	15.37 x 4.33 x 11.53	21.57 x 4.13 x 12.44	21.49 x 4.92 x 12.71
Weight (kg/pounds)	35kg/77lbs	49kg/88lbs	60kg/132lbs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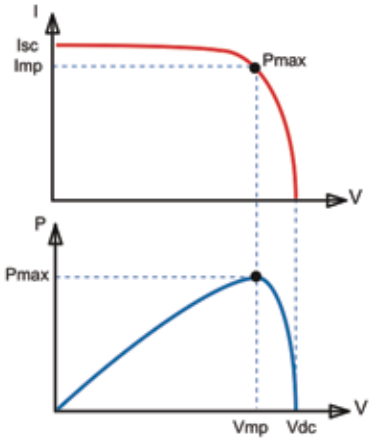
BLUESOLAR EN SMARTSOLAR LAADCONTROLLERS MPPT - OVERZICHT



Maximum Power Point Tracking (MPPT)

Upper curve:
Output current (I) of a solar panel as function of output voltage (V).
The Maximum Power Point (MPP) is the point Pmax along the curve where the product I x V reaches its peak.

Lower curve:
Output power P = I x V as function of output voltage.
When using a PWM (not MPPT) controller the output voltage of the solar panel will be nearly equal to the voltage of the battery, and will be lower than Vmp.

MPPT Control

SmartSolar Control

VictronConnect Application

Feature highlights common to all models

- Ultra-fast Maximum Power Point Tracking (MPPT).
- Advanced Maximum Power Point Detection in case of partial shading conditions.
- Outstanding conversion efficiency.
- Natural convection cooling.
- Automatic battery voltage recognition.
- Flexible charge algorithm.
- Over temperature protection and power derating when temperature is high.

Sizing options:

- Suitable for a variety of battery voltages. Most models connect to 12, 24, and 48V batteries, some only connect to 12 and 24V batteries, or only to 48V batteries.
- Charge currents rating from 10A all the way up to 100A.
- Maximum PV array Voc voltages ranging from 75V up to 250V.
- Multiple chargers can be used in parallel, for large systems we recommend to use the models with a VE.Can communication port.

PV terminal options:

- TR - one positive and one negative screw terminal.
- MC4 - 3 pairs of paralleled MC4 connectors.

Bluetooth options:

- SmartSolar models have Bluetooth.
- BlueSolar models do not have Bluetooth. They can be retrofitted to have Bluetooth by connecting the VE.Direct Bluetooth Smart dongle. Advantage: the product is not Bluetooth accessible when the dongle is not connected. Note that on the SmartSolar models, Bluetooth can be disabled.

Display options:

- VictronConnect Application. Connects via Bluetooth or via the VE.Direct - USB interface
- MPPT Control. Connects to all models via a VE.Direct cable
- SmartSolar Control Display. Plugs directly into the housing of the larger models
- GX device
- VRM website (GX monitoring device needed)

Communication ports:

- VE.Direct - all models
- VE.Direct and VE.Can - limited models. VE.Can is especially suitable for systems with multiple solar chargers. All units are simply “daisy chained” to each other with a single RJ45 cable between each unit and also between the last unit in the chain and the a GX monitoring device.

Temperature sensor options:

- Internally (all models).
- Externally via the Smart Battery Sense (only SmartSolar models).

Load output options:

- Physical output - On the 10, 15 and 20A models.
- Virtual output - via VE.Direct TX digital output cable and the BatteryProtect or a solid-state relay.

Remotely enabling and disabling the charger:

- All larger units feature the Victron standard remote on/off terminals. All models that don’t feature an onboard Remote on/off terminal can be remotely controlled by using the VE.Direct non inverting remote on/off cable – ASS030550310. Note that this prohibits using the VE.Direct port for anything else.

Firmware update options:

- Local updates via the VictronConnect Application (via Bluetooth or USB-VE.Direct interface)
- Remote updates via VRM website and a GX device

Optional accessories:

- VictronConnect Application (free download)
- Wire boxes, to cover and protect the terminals. See table on page 2 for wire box types
- Control and display panels: MPPT control or SmartSolar control)
- GX monitoring device (CCGX, Venus GX, Octo GX or Cerbo GX)
- Data cables: VE.Direct cable, RJ45 Cable (VE.Can models only), USB-VE.Direct interface
- External control cables: TX cable, non-inverting cable
- Bluetooth dongle (for non-smart models)

More information:

- To access the above-mentioned documents or information: press the search button on our website and enter the appropriate search word.
- For connection to a Color Control GX or other GX device see: https://www.victronenergy.com/live/venus-os:start.

BlueSolar Charge Controller	Load output	Battery voltage	Optional display	Bluetooth	Com. port	Remote on-off	Programmable relay	Wire Box
75/10	15A	12/24V	MPPT control	Optional dongle	VE.Direct	No	No	S 75-10/15
75/15	15A	12/24V	MPPT control	Optional dongle	VE.Direct	No	No	S 75-10/15
100/15	15A	12/24V	MPPT control	Optional dongle	VE.Direct	No	No	S 100-15
100/20 (up to 48V)	20A/20A/1A	12/24/36/48V	MPPT control	Optional dongle	VE.Direct	No	No	S 100-20
100/30	No	12/24V	MPPT control	Optional dongle	VE.Direct	No	No	M
100/50	No	12/24V	MPPT control	Optional dongle	VE.Direct	No	No	M
150/35	No	12/24/36/48V	MPPT control	Optional dongle	VE.Direct	No	No	M
150/45	No	12/24/36/48V	MPPT control	Optional dongle	VE.Direct	No	No	M
150/60-Tr	No	12/24/36/48V	MPPT control	Optional dongle	VE.Direct	No	No	L
150/60-MC4	No	12/24/36/48V	MPPT control	Optional dongle	VE.Direct	No	No	L
150/70-Tr	No	12/24/36/48V	MPPT control	Optional dongle	VE.Direct	No	No	L
150/70-MC4	No	12/24/36/48V	MPPT control	Optional dongle	VE.Direct	No	No	L
150/100-Tr VE.Can	No	12/24/36/48V	MPPT ctrl & SmartSolar ctrl	Optional dongle	VE.Direct & VE.Can	Yes	Yes	XL
250/70-Tr VE.Can	No	12/24/36/48V	MPPT ctrl & SmartSolar ctrl	Optional dongle	VE.Direct & VE.Can	Yes	Yes	L
250/100-Tr VE.Can	No	12/24/36/48V	MPPT ctrl & SmartSolar ctrl	Optional dongle	VE.Direct & VE.Can	Yes	Yes	XL
SmartSolar Charge Controller	Load output	Battery voltage	Optional display	Bluetooth	Com. port	Remote on-off	Programmable relay	Wire Box
75/10	15A	12/24V	MPPT control	Built-in	VE.Direct	No	No	S 75-10/15
75/15	15A	12/24V	MPPT control	Built-in	VE.Direct	No	No	S 75-10/15
100/15	15A	12/24V	MPPT control	Built-in	VE.Direct	No	No	S 100-15
100/20 (up to 48V)	20A/20A/1A	12/24/36/48V	MPPT control	Built-in	VE.Direct	No	No	S 100-20
100/30	No	12/24V	MPPT control	Built-in	VE.Direct	No	No	M
100/50	No	12/24V	MPPT control	Built-in	VE.Direct	No	No	M
150/35	No	12/24/36/48V	MPPT control	Built-in	VE.Direct	No	No	M
150/45	No	12/24/36/48V	MPPT control	Built-in	VE.Direct	No	No	M
150/60-Tr	No	12/24/36/48V	MPPT ctrl & SmartSolar ctrl	Built-in	VE.Direct	Yes	Yes	L
150/60-MC4	No	12/24/36/48V	MPPT ctrl & SmartSolar ctrl	Built-in	VE.Direct	Yes	Yes	L
150/70-Tr	No	12/24/36/48V	MPPT ctrl & SmartSolar ctrl	Built-in	VE.Direct	Yes	Yes	L
150/70-MC4	No	12/24/36/48V	MPPT ctrl & SmartSolar ctrl	Built-in	VE.Direct	Yes	Yes	L
150/70-Tr VE.Can	No	12/24/36/48V	MPPT ctrl & SmartSolar ctrl	Built-in	VE.Direct & VE.Can	Yes	Yes	L
150/70-MC4 VE.Can	No	12/24/36/48V	MPPT ctrl & SmartSolar ctrl	Built-in	VE.Direct & VE.Can	Yes	Yes	L
150/85-Tr VE.Can	No	12/24/36/48V	MPPT ctrl & SmartSolar ctrl	Built-in	VE.Direct & VE.Can	Yes	Yes	XL
150/85-MC4 VE.Can	No	12/24/36/48V	MPPT ctrl & SmartSolar ctrl	Built-in	VE.Direct & VE.Can	Yes	Yes	XL
150/100-Tr VE.Can	No	12/24/36/48V	MPPT ctrl & SmartSolar ctrl	Built-in	VE.Direct & VE.Can	Yes	Yes	XL
150/100-MC4 VE.Can	No	12/24/36/48V	MPPT ctrl & SmartSolar ctrl	Built-in	VE.Direct & VE.Can	Yes	Yes	XL
250/60-Tr	No	12/24/36/48V	MPPT ctrl & SmartSolar ctrl	Built-in	VE.Direct	Yes	Yes	L
250/60-MC4	No	12/24/36/48V	MPPT ctrl & SmartSolar ctrl	Built-in	VE.Direct	Yes	Yes	L
250/70-Tr	No	12/24/36/48V	MPPT ctrl & SmartSolar ctrl	Built-in	VE.Direct	Yes	Yes	L
250/70-MC4	No	12/24/36/48V	MPPT ctrl & SmartSolar ctrl	Built-in	VE.Direct	Yes	Yes	L
250/70-Tr VE.Can	No	12/24/36/48V	MPPT ctrl & SmartSolar ctrl	Built-in	VE.Direct & VE.Can	Yes	Yes	L
250/70-MC4 VE.Can	No	12/24/36/48V	MPPT ctrl & SmartSolar ctrl	Built-in	VE.Direct & VE.Can	Yes	Yes	L
250/85-Tr VE.Can	No	12/24/36/48V	MPPT ctrl & SmartSolar ctrl	Built-in	VE.Direct & VE.Can	Yes	Yes	XL
250/85-MC4 VE.Can	No	12/24/36/48V	MPPT ctrl & SmartSolar ctrl	Built-in	VE.Direct & VE.Can	Yes	Yes	XL
250/100-Tr VE.Can	No	12/24/36/48V	MPPT ctrl & SmartSolar ctrl	Built-in	VE.Direct & VE.Can	Yes	Yes	XL
250/100-MC4 VE.Can	No	12/24/36/48V	MPPT ctrl & SmartSolar ctrl	Built-in	VE.Direct & VE.Can	Yes	Yes	XL

Color Control GX

Venus GX

Cerbo GX

Smart Battery Sense

VE.Direct Bluetooth Smart Dongle

VE.Direct to USB interface

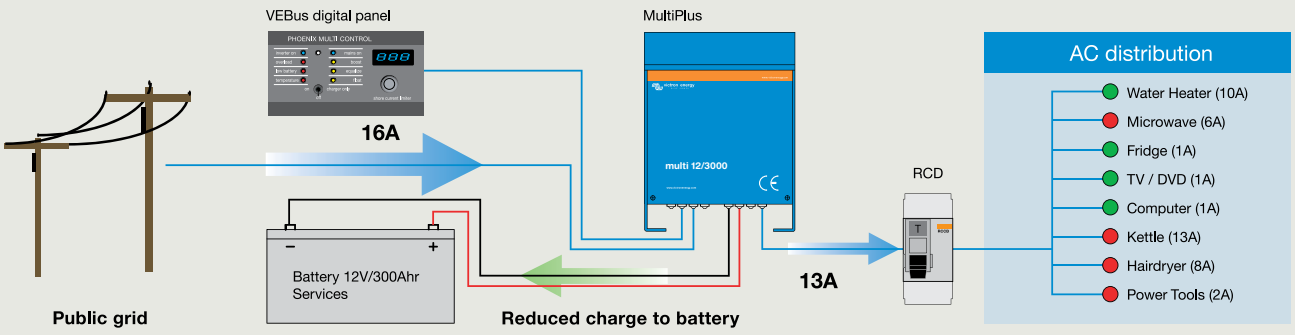
MULTIPLUS PRINCIPLE

Inverter/charger system with intelligent shore and generator power management

PowerControl: Dealing with limited generator or grid power All models in the MultiPlus range feature powerful battery chargers. When the largest model is working hard it can draw almost 10A from a 230V supply. Using the remote panel it is possible to 'dial-in' the maximum current that is available from mains or generator. The MultiPlus will then automatically regulate the charger taking account of other system AC loads and ensuring the charger only uses what is spare. This way it is possible to avoid tripping the mains power or overloading the generator.

POWER CONTROL©

Battery charger reduces its output, if required, to avoid overload of supply when system consumption is high.

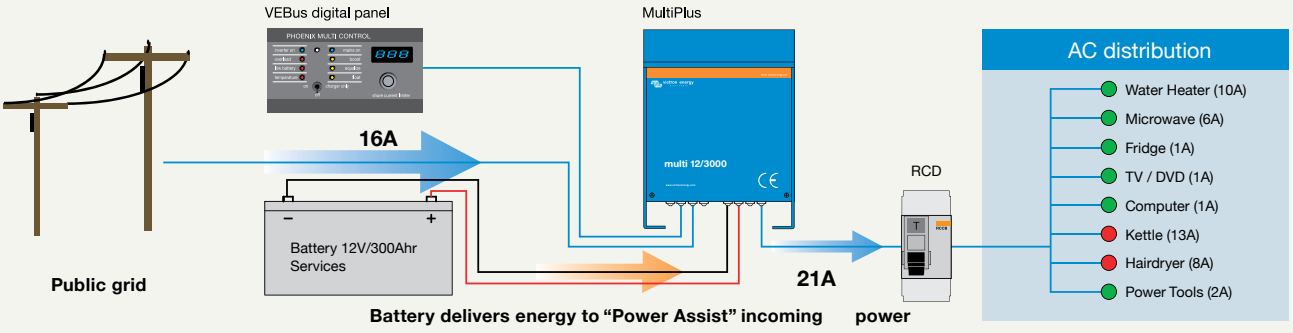


PowerAssist: Boosting the power available from mains or generator, an innovative feature of Multiplus. The feature that most distinguishes the MultiPlus from other inverter/chargers is PowerAssist. This feature takes the principle of PowerControl to a further dimension by allowing a MultiPlus to supplement the power available from mains or generator to 'assist' during periods of high demand. Peak power demand is almost always sustained only for short periods, either a few minutes (in the case of items like cooking appliances) or just a few seconds (in the case of the burst of energy needed to start an air-conditioning or refrigeration compressor).

With the capacity of the generator or mains power set on the remote panel, the MultiPlus detects when the load is becoming too much for the supply and will instantly provide the extra power required. When the demand has reduced, the unit returns to charging the battery. This feature is equally effective in large and small systems helping to reduce the required generator capacity or to achieve greater things with limited mains power. There is even a special feature to enable the MultiPlus/ Quattro to work perfectly with portable generators.

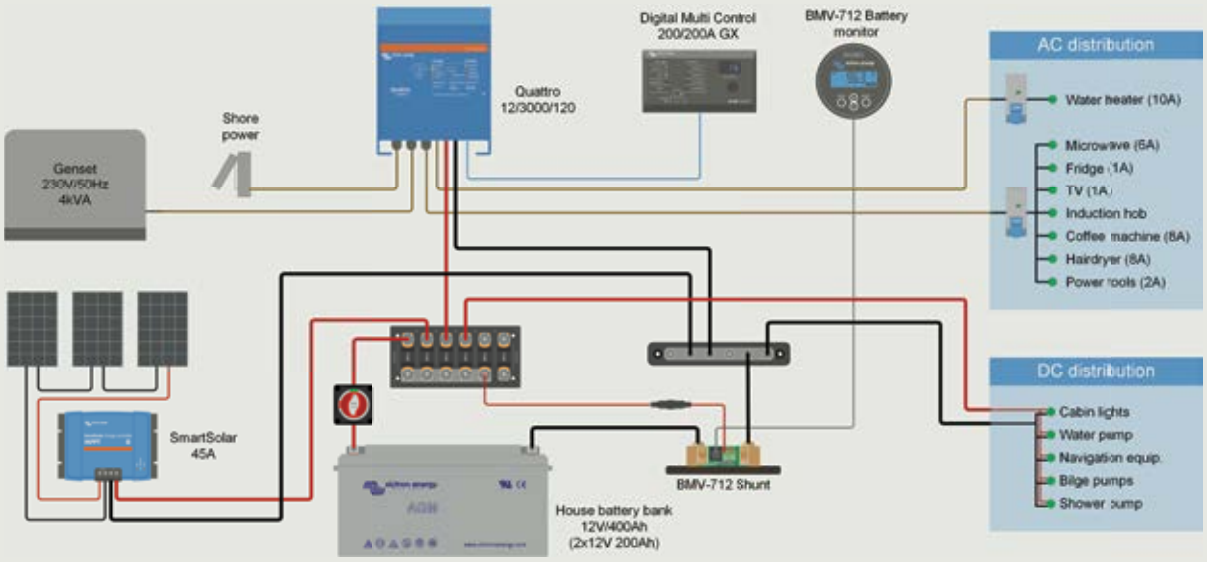
POWERASSIST©

Inverter boosts incoming power, if required, to avoid overload of supply when system consumption exceeds supply.



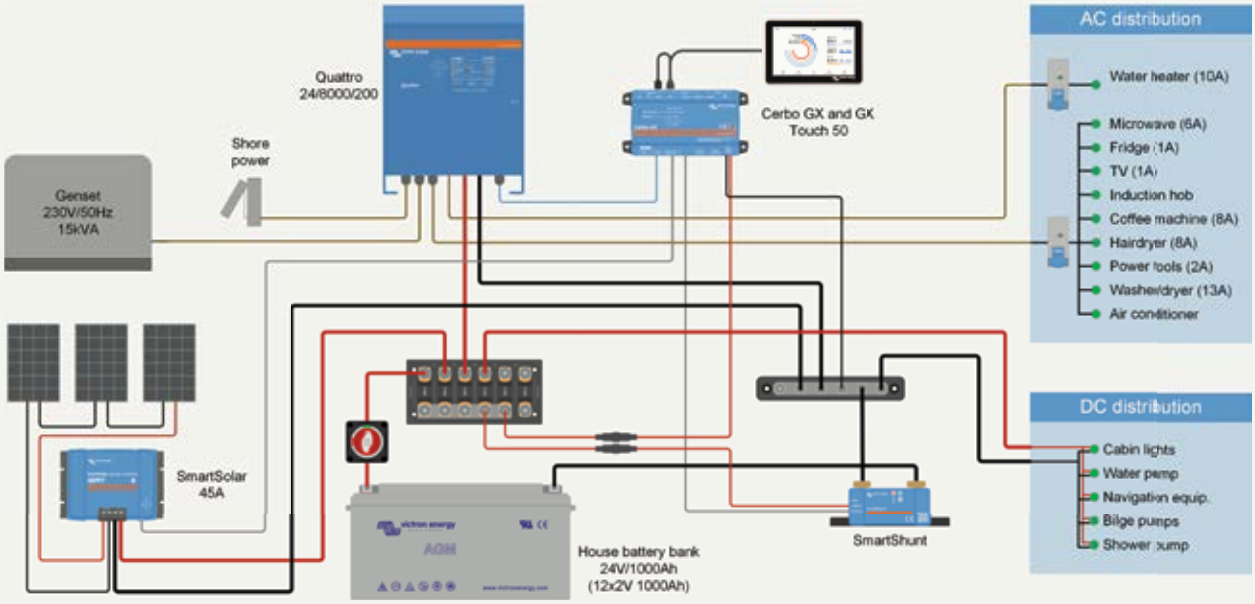
SYSTEM EXAMPLES

Comfort system - 7 kVA (30A) capacity



Appliance	System
Lighting	Quattro 12/3000/120
Communication & navigation	BMV-712 battery monitor
Water heater	2x12V/200AH and 1X80AH batteries
Microwave oven	Digital control remote panel
2 ring introduction hob	Alternator 12/150
Coffee machine/Kettle	DC Link Box
TV/DVD	Isolation transformer
Laptop	Cyrix battery separator
Smal chargers (mobile phone, electric shaver)	
Refrigerator and freezer	Solarpanel and MPTT Solar charger

Comfort plus system - 25 kVA capacity



Appliance	System
Lighting	2 xQuattro 24/5000/120
Communication & navigation	Color Control GX
Water heater	4x12V/200AH and 1X80AH batteries
Electric gallery with 4 ring induction hob, micro-wave/combi oven, refrigerator, freezer, washer/ dryer.	Color Control GX
Coffee machine and kettle	Alternator 12/150
TV/DVD	DC Link box
Multimedia PC	Isolation transformers
Small chargers (mobile, phone, shaver etc)	
Modest air-conditioning	Solarpanel and MPTT Solar charger

PROFESSIONAL VEHICLE POWER SYSTEMS

System schematic drawing & requirements

Feel free to contact your local Victron dealer. They are happy to help and trained with the highest of know-how to translate your needs into a robust system. Find your local dealer at **'Where to buy'** on our website.

PROFESSIONAL VEHICLE POWER SYSTEMS

Modular solutions to meet any mobile power demand

Victron Energy offers one of the widest ranges of robust, connected power products, proven to perform in the most demanding conditions. Our advanced systems solve complex mobile power challenges and are adaptable to the specific needs of professional vehicles, from utility fleets to emergency response units.

Feel free to ask your local Victron dealer for advice.

www.victronenergy.com

Inverter/chargers — Inverter/charger/MPPT — Inverters

Solar chargers from small — ...to large

Battery chargers — EV charging station — DC distribution systems

Battery monitoring — System monitoring

And more

Battery protection - DC-DC converters and chargers - lithium batteries - AGM and GEL batteries - battery management systems - votage sensitive relays - fuses and fuse holders - busbars -battery switches

PROFESSIONAL VEHICLE POWER SYSTEMS

Why Victron?

At Victron Energy, we're as dedicated and driven to developing and improving power solutions today as we were when we started in 1975. Thanks to rigorous testing, customer feedback, data, and knowledge-sharing, we improve and develop 24/7. We are powered by know-how; it keeps us and our users going, ensuring peace of mind in automotive applications for years to come.

01

It's not one thing that makes it all work.

Our modular, robust and connected power systems deliver unequalled reliability, even in the harshest of climates. But it's our unique combination of advanced hard- and software, intelligent monitoring apps, a worldwide network of highly trained, authorised professionals, and widespread repair centres that turns a Victron Energy system into an unbeatable system, powered by know-how.

02

Reliability powers long service life cycles.

When making power supply investment decisions, calculations based solely on price can be misleading. True performance and expected service life are equally important factors. Fortunately, Victron Energy systems consistently meet our high standards for both performance and longevity (when used as designed). Our 5 or 10 year warranty combined with fair, fast repair policies ensure your investments remain protected and reliable for years to come

Endless energy
since 1975

03

How efficiency translates into cost-effectiveness.

With battery-based systems, efficiency is key to providing excellent cost-effectiveness. From our incredibly efficient SmartSolar Charge Controllers to the intelligent way our inverter/ chargers minimise generator use, a Blue Power system ensures every detail is carefully considered. This attention to detail, combined with our reputation for extreme resilience and long service life, translates into truly cost-effective solutions, especially when compared to initially 'cheaper' alternatives.

04

Smart monitoring for system optimisation

Monitoring is crucial to fine-tune and optimise energy harvest and use based on ever-changing circumstances. With Victron, the power of know-how is at your fingertips. Through our industry-leading and free VictronConnect app, you maintain perfect control over your system from anywhere. With our app and VRM portal, you can monitor the entire system, adjust settings and identify potential issues early by setting up alerts and alarms.

05

Our worldwide dealer network is by your side.

Our global network of around 1,000 highly trained distributors, installers, and service partners is always on hand to help, providing equipment advice, installation recommendations, aftercare and technical support. With the Victron Energy team, our partners, and lively community behind you, the power of know-how is always by your side.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BLUE POWER
Energy. Anytime. Anywhere.


The perfect escape. Powered by know how.
When you want the comforts of home away from home,
it's good to know the power of know-how is by your side.
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With the power of know-how by your side, you get **Energy. Anytime. Anywhere.**

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